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Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 4 AUGUST, 1935 Number 8

THIS ISSUE

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Dermatoses Must Be Fi

The Journal of
Occupational Diseases
and Traumatic Surgery
for
Physicians and Surgeons in Industry

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Reg. U. S. Pat. Off.

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"Refraining e'en from lawful things,
They bowed the neck to bear
The unadorned yoke that brings
Stark toil and sternest care.
Wherefore through them is Freedom sure;
Wherefore through them we stand
From all but sloth and pride secure,
In a delightsome land.

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"Then, fretful, murmur not they gave
So great a charge to keep,
Nor dream that awestruck Time shall save
Their labour while we sleep.
Dear-brought and clear, a thousand year,
Our fathers' title runs,
Make we likewise their sacrifice,
Defrauding not our sons."
—KIPLING.

The Journal of Traumatic Surgery and Occupational Diseases

The Law, the Science and the Economics of Industrial Health

Volume 4 | AUGUST, 1935 | Number 8

What Are Occupational Diseases?

—*A Little of the Kind of Frank Discussion That Will Eventually Develop the Right Answer**—

Recent Experiences

A. J. LANZA, M. D., Metropolitan Life Insurance Company, New York: "To speak on occupational diseases is a large order. I cannot cover this subject in the course of a short talk, but I shall give some impressions of recent experiences. These may appear disjointed and incoherent. There is no really accurate terminology in this field, intelligible to the ordinary layman. I used to think I could define an occupational disease. I am forced to conclude that I do not know what an occupational disease is, who gets it, and why. An occupational disease is usually described as a disease arising out of and in the course of an occupation peculiar to an individual and having a direct relation with the cause of the illness. I doubt whether this definition has any real existence now. The Supreme Court of Idaho has recently decided that Rocky Mountain tick fever is an occupational disease. The case was that of a grocery salesman who, driving an automobile in the course of his business, got out of his car to repair a tire in rainy weather. He could not move the car, contracted tick fever and died. The conclusion of the court is that he was attacked by the tick while getting out of the mud. If this is so, what about the bite of a mosquito or the bite of a hookworm. This decision affords a considerable field for expansion of the term occupational disease.

"As we are interested in occupational diseases from an insurance angle we decided to make a contribution by getting out a monograph on the subject. We wrote to state officials in every state with compensation, and to every province in Canada. We wanted to know the amount of money paid on claims, the total number of claims, divided by the diagnosis. To find out the diseases common to most cases seemed simple. Nevertheless we did not get the information. It was not available. How are we to know what the liability is under this and that law, if we cannot find out what the experience is? We made up a list of metal poisonings, lead, arsenic and mercury and compared this with the report of a state. We could not identify any comparison to indicate the amount of money paid for those diseases. This was impossible, both in the United States and Canada. We were defeated at the very beginning. No two states tabulated in the same way. Though the schedules are alike, the completed reports in some states do not even separate accidents from sicknesses.

"I wrote to a certain official to ask: 'whether carbon dioxide poisoning is on your schedule; whether there are any claims? If so, where did they occur? If not, where would you expect to find them? He answered: 'We never had any claims, but would expect to find them in breweries and garages'. Might it not be a function of this organization to get something started, to obtain accurate information and a uniform method of statistics as to what is paid on claims, who got the money, and why. It must be in the records. We cannot talk intelligently if we do not know the experience. It is not unreasonable to ask the leading industrial states whether they have a schedule to list claims, the diagnosis and other data for occupational diseases.

"As to 'dust diseases' we want to know what types of industrial diseases are harmful, and how harmful they are. In the past we have tested by animal experimentation. This consists in dusting the animal. This is a very slow process. You may have to dust from three to five years. This is not unusual in research. But this method is useless to the industrialist.

"In cooperation with the United States Public Health Service we developed a mechanism for testing the harmfulness of dust. This consists in the injection of a small quantity of dust in suspension in the peritoneal cavity. The reaction of the peritoneum or any other tissue is approximately the same as lung tissue. Puncture is much faster. You inject a series of guinea pigs or rabbits with any kind of dust. Killing weekly, you see a lesion in the peritoneum. The injection test covers about 112 days. You get an answer

* From the Minutes of a Meeting of the Association for the Advancement of Industrial Medicine and Surgery, April 11, 1935.

in 90 days, which, for all practical purposes, is a reasonable length of time.

"The reaction in the peritoneum is of three types. We get a 'reaction of absorption', a 'reaction of proliferation' and an 'inert reaction'. The 'reaction of absorption' takes place when the dust disappears. The injection in the peritoneum disappears without a trace. There is a temporary reaction with leucocytes. In a few weeks everything has vanished. There is no scarring. The substances giving this reaction are calcite, limestone and gypsum among others.

"The 'reaction of proliferation' is very different and much more drastic. The reaction takes a nodular or tumor form which continues to spread and grow. Silica, flint and other siliceous materials give this reaction, which is a progressive fibrosis.

"The 'inert reaction' lies between the two extremes. The nodule after the first inflammatory reaction flattens out. It does not proliferate. The dust is carried to the surrounding tissue by the injury and stays there. The trouble subsides after three months. Soapstone, bituminous coal and precipitated ash give this reaction. Proliferation causes fibrosis. The 'inert reaction' may cause a pulmonary fibrosis, not associated with disability or tuberculosis.

"We are now getting to know for medical purposes, if not for legal, whether dust is injurious or negligible. This is a very hopeful sign. Why nothing but pure silica gives proliferation we do not know, but this research may clear up much of the confusion as to whether all or only certain dusts are harmful and what dusts are more harmful than others.

"The State of New York passed a blanket law. It appears logical that a law should define clearly what you intend to do, but the trend is toward the blanket law. The annual conference of state insurance officials of the United States and Canada in 1928 went on record unanimously in favor of blanket laws. When Dr. Canning, of the Saranac Laboratory, went to Wisconsin for certain mining companies, there was great confusion in dust diseases. They are now bringing order out of chaos there. No awards are made in Wisconsin now, unless clearly defined. It may work out in a satisfactory manner after the usual painful experience. This organization is particularly concerned as to accurate diagnosis in occupational disease. You might appoint a committee to report to the membership on the development of tests and techniques for the detection of occupational poisoning.

"Lead poisoning has accumulated an enormous library. The amount of research in every civilized country is incredible. This subject should have been exhausted years ago. It should now be so clearly defined to enable us to determine without difficulty whether an individual had lead poisoning or not. Yet within the last two weeks a new test for lead poisoning has been announced. Its value we do not know. This month's issue of *Arch. Path.* has a paper on volatile solvents in the tissues. All this has a very wide medicolegal value. But some people rush into print, who later may have to retract.

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Pulmonary Tuberculosis

GEORGE ORENSTEIN, M. D., New York: "Regarding pulmonary tuberculosis and its relation to compensable diseases, the important thing to consider is the tendency to interpret whatever pathology we find from an organic standpoint. In diseases of the lung and the tracheobronchial tree the hemorespiratory function is important. The organic standpoint shows nothing. We may have a case of right heart engorgement with emphysema. The pulse and chest findings are normal. You may get an impression of malingering, but we really have a very definite hemorespiratory loss of function with complete anoxemia. The patient is incapacitated.

"The evaluation of this condition is not by x-ray examination but by careful study of the hemorespiratory function. The individual can't do the ordinary routine of his work. The question is how to determine whether it is silicosis or a chemical infection. This is very difficult. The important thing is the emphysema. The hypertrophic type can't be determined by x-ray. The physical findings show a definite widening of the intercostal spaces. 'Cardiac right heart' can't be recognized until it is in its last stages.

"A case looks like silicosis. It is a compensatory emphysema with a definite decrease in oxygen saturation and an increase in oxygen decompensation, an increase in red blood cells and a wide hemoglobin. There are signs of a definite anoxemia. It looks like a compensation disease.

"Another was a case of tuberculosis with a complication of metal dust. Autopsy showed a chronic productive tuberculosis of the cirrhotic form with no evidence of silicosis.

"The x-ray is misleading with a history of occupation in cases of this type. I want to stress the fact that in forming any judgment as to diseases of the tracheobronchial tree you must find out whether there is an actual decrease in the hemorespiratory system of the lung. If the patient has such a condition, he cannot carry on. He is disabled. In this connection I would like to refer you to Meekin and Davie, "Respiration and Diseases." You can't have a correct concept unless you have a knowledge of the hemorespiratory function. The question to be considered is whether the patient is getting a sufficient amount of oxygen to carry on, and not from any organic standpoint."

Dust Diseases

IRVING GRAY, M.D., New York: "As to dust diseases in relation to chest pathology and symptoms, blanket laws with respect to silicosis tax the ingenuity of all physicians. There are many legal complications as to responsibility. The patient may develop pathology when removed far from his occupation.

"What about the determination of heavy metals in the skin by lines of lead, silver, copper, uranium and other heavy metals, as an indication and diagnosis of metal poisoning? Specialists in the Royal Victoria Hospital of Montreal, and physiologists of McGill have found lead present in the

spinal fluid of neurological cases. Dr. Gall investigated normal skins, neurological and lead cases. The lead lines obtained, he found were more apparent in some cases than in others. This may be an index of lead retention in the tissues. To determine a method to rid tissue of the metal, we know it has been excreted by giving ammonium chloride. The pH of the tissue and a low calcium diet drain the lead. We find increased lead in urine and stools.

"All foodstuffs contain lead. Lead arsenate as an insecticide is spread over growing fruits. Lead may be taken by means of the water supply. A high phosphorus diet is used to prevent reabsorption. The presence of abnormal lead may change the neurological system. In the case of a small boy with a line of lead, you have a picture of atrophy of the hand. You must discover all foci of infection. It is not sufficient only to say that the anterior horn cells are affected. You can test by skin puncture. The tests show one to four. One is normal, four being high content.

"You cannot show lead in the skin as definite lead poisoning. It may vary from day to day. You might study thousands of cases. To show whether this test has any value you must establish criteria. What is normal and abnormal lead in the skin? The presence of a lead line in the skin as an indication of lead poisoning is a hypothesis that must be proved."

Medical vs. Lay Diagnosis

CHARLES T. GRAHAM-ROGERS, M.D., of the Department of Hygiene, State of New York Department of Health: "I have been in this work since 1905. New York was the first state to recognize medical hazards in industry. Occupational diseases are not new. They are the same diseases as in the time of Hippocrates. They have recently become a 'bugaboo' because of economic and financial reasons. We find out they cost money, so we wake up.

"Statistics show that 1% to 2% of all compensation cases are occupational diseases; but on the farm or in the home, we have the same organic changes. These diseases are not strictly occupational. You should know the diagnosis. The legal aspect takes a different point of view. It must be proved. I can't talk freely because of department policy, but I want to say that occupational diseases are not an entity. It is medicine. Treatment is easy, once you know the diagnosis. Let the doctors decide what is the diagnosis, and not the laity."

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"In occupational dermatoses you must differentiate between 'fungus infection' and 'dermatitis venenata.' In many eruptions, how can you prove they are due to the occupation? The connection between fungus infection and occupational disease is very doubtful — whether the occupation was first or whether the fungus was first, or whether the fungus was first and was increased by the occupation.

"The commercial companies should be able to produce these statistics. How many occupational diseases in five years? How many skin diseases, whether due to lead, mercury, etc.? The age, sex and temporary and permanent disability? How many malingering cases? Patients who appear to be too slow in getting well? Very difficult to prove. Very simple to bring about. The patient by rubbing carbona or benzene into the skin can continue the practice for a long time.

"As to the hypothesis, based upon metal in the skin, you find bands of metal in all skins. The metals are present in cans used in canning food. No skin diseases result. Finding the bands has nothing to do with a skin disease."

DR. LANZA (concluding): "Dr. Orenstein's statement as to the amount of impairment of function in lung diseases brings up the fact that, through nobody's fault, we tend to pay compensation for diagnosis and not disability.

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The subject, therefore, was the Compensation Law Amendment to be effective July 1, 1935[1] (Senate Bill No. 19).

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In answer to which Mr. Garey read the following opinion:

"The opinion requested is a most vital and important one, and I regret that I am not now in a position, due to a lack of sufficient time to make an adequate survey of the authorities, to state my opinion thereon. However, it may not be amiss to direct your attention to those points of the bill which, in my opinion, may involve a question of constitutionality and which may be points of attack by those who undoubtedly will be aggrieved by the enforcement of the provisions of the bill.

"It is interesting to observe that the original Workmen's Compensation law of this state was held unconstitutional by our Court of Appeals on the ground that the law deprived persons subject thereto of property without due process of law. It was only after an amendment to the State Constitution that the Workmen's Compensation law was sustained by the state courts and by the Supreme Court of the United State as well.

"In sustaining the constitutionality of the Workmen's Compensation law prior to its amendment by Senate Bill No. 19, the United States Supreme Court held that such acts might be sustained even though employers and employees were deprived of certain rights which they had had at common law, provided that they were given in substitution therefor new rights which under all the circumstances may be deemed to be not arbitrary and not unreasonable, and sufficiently beneficial to offset the detriment imposed by such laws.

"In arriving at the reasonableness of the new remedies given the employers and the employees, the United States Supreme Court gave careful consideration to the scale of compensation and to the methods of making awards as benefits sufficient to compensate for the detriment, and thus came to the conclusion that the Workmen's Compensation law was not violative, in the form then before it for determination, of the United States Constitution.

"Applying the tests and the reasoning of the Supreme Court, in my opinion it is questionable whether that Court would sustain the law as now amended in that the choice of physicians has been taken from the employer and given to the employee. Under the old Act, while the employer is required to pay compensation even though he was not at fault, the Supreme Court held that such provision was not unreasonable because the amount of compensation was fairly certain and fixed. Now, however, the employer does not have the right to select the physician and, therefore, has no control over the amount of medical fees or over the competence of the physician; and the amount which the employer will therefore necessarily have to pay undoubtedly will be increased to a point which might be held to constitute a violation of the Fourteenth Amendment of the Constitution.

"The new amendment appears to be vulnerable in the respect also that it delegates to a non-governmental body the selection of those physicians and bureaus who shall be authorized to render treatment in workmen's compensation cases. While it well may be that such a delegation in and of itself may be constitutional, the fact that the legislature has failed to set up in the Act any standards by which the various boards shall be guided in recommending or failing to recommend candidates for such authorization, appears to be a fatal defect in the statute.

"It is fundamental that while the legislation may create a body to administer a law, it cannot grant such a body the power to create law, and it may be that the boards to which the power of recommendation has been delegated will not merely administer the law but in acting upon whatever standards they select may in fact be actually creating law. If that is so, there is no doubt that the Act in this respect at least is unconstitutional and beyond the power of the legislature . . . .

"Another related point concerns the power to revoke authorizations theretofore granted under the new Act for 'professional or other misconduct' without setting up any standards of what shall be deemed to be 'professional or other misconduct'. This provision, so lacking in definiteness and certainty, is not sufficient to warrant a revocation of such authorization. The right of a physician to be secure in the privilege of practicing his profession is thereby made to depend not upon any statutory definition but simply upon the opinion of the board as to the impropriety of his conduct. The decision of the Supreme Court of the United States holding the Lever Act unconstitutional would seem to be controlling on this particular point.

"The courts have held that statutes regulating conduct and imposing a penalty, such as the revocation of a license, must be definite and certain and must furnish a reasonably comprehensible standard of conduct capable of being understood and applied by the individuals affected and by courts and juries. In brief, before a penalty or forfeiture can be lawfully imposed the alleged wrongdoer must be able to know that a given act is forbidden.

"It is noteworthy in this connection that, with respect to Compensation Medical Bureaus, no provision is made for appeals from the determination of these extra-judicial bodies with respect to recommendation of authorization. The situation obtains despite the fact that the bodies which will pass on their qualifications are potential competitors.

"Other aspects of this new legislation are now being made the subject of careful investigation by my office. But this I wish to bring forcibly to your attention: Any person who is required to make or file any application of any sort under the new statute should by all means reserve to himself all his right to contest the validity of the Act upon constitutional grounds or otherwise. This is necessary by reason of the doctrine which has recently been asserted by the government in the NRA cases, that one who accepts the benefit of an Act is deemed to waive his right to contest the constitutionality of that Act. Such a reservation may be effected by insertion of suitable language to that effect upon such applications or other papers."

At the conclusion of Mr. Garey's remarks Dr. Wittmer introduced Samuel Kaufman, Chief Counsel for the Aetna Life Insurance Company, and asked him the following question:

"In making application for authorization under this bill does not the physician permanently waive and rescind his constitutional right of contract and enforcement of same when he signs an

application in which 'He shall further agree to refrain from subsequently treating for remuneration as a private patient any person seeking medical treatment in connection with, or as a result of any injury compensable in this chapter, if he has been removed from the list of physicians authorized to render medical care in this chapter, or if the person seeking such treatment has been transferred from his care in accordance with the provisions of this chapter?' "

In reply Mr. Kaufman stated that most of the legal questions were treated by Mr. Garey. The legislation, he said, was being carefully studied by the legal departments of the insurance companies and self-insurers to map out a course of procedure. They have already concluded that a number of items in the law are unconstitutional and so provide a cause of action. He said:

"I want to emphasize right here that a physician would waive his rights under this law unless he specifically reserved them." He did not care to recommend the precise phraseology of reservation.

Radium Dial Painting

A STUDY of the effects on health of radium dial painting was undertaken by the U. S. Public Health Service* at the request of a conference called by the Surgeon General. A committee was appointed to act in an advisory capacity as to the character of the work to be undertaken and the nature and efficiency of tests to be used. The investigation included a study of the occupational environment (with analysis of jobs, a sanitary survey, a determination of the radioactivity of dust and of the amounts of gamma and beta radiation and of radon in the workrooms); electroscopic determinations on the workers (tests for gamma radiation from the body and of the exhaled air for evidence of radon and of thoron); industrial medical histories of the workers; physical and blood examinations; dental examinations, including x-rays of the teeth and jaws.

The investigation was begun in June, 1929, and the field work completed in March 1930. Seven factories were surveyed. Examinations were made of 242 persons, 31 girls being classified as controls (without exposure to radium), 70 classified in Group A (with exposure since January 1, 1927, only), 103 in Group B (with exposure, in part at least, before January 1, 1927). Fourteen men and 24 girls were not included in this classification.

There was evidence of the accumulation of radioactive material in the bodies of radium dial painters and other radium workers, not only in Group B, but also in Group A, whereas, within the limits of accuracy of the measurements, no indication of the presence of radium was noted in the controls. X-rays of the alveolar regions of workers in Group A did not indicate any bone changes which could not be attributed to dental causes. On the other hand, red cell and hemoglobin determinations showed, on the average, a slight tendency to be lower in Group A than among the controls. It is therefore felt that the abolition of pointing the brush with the mouth and other changes in practice which may have been introduced at the same time have not entirely solved the problem of radium deposition in the bodies of radium workers in the dial painting industry.

Determinations of radioactivity of the dust in the air of the workrooms (both generally and in close proximity to workers) and of the radon in the air suggest that inhalation of radioactive material is a factor as well as ingestion. In making suggestions for preventing radium poisoning the authors have had in mind extreme cleanliness in the factory, namely, good housekeeping, thorough personal cleanliness of the workers, and adequate ventilation, both general and local.

* SCHWARTZ, LOUIS; MAKEPEACE, F. C.; DEAN, H. T., *J. Indust. Hyg.*, November, 1933.

The Doctor

and the Cost of Hiring

Chapter II

What the Medically Unexamined Bring

THE first chapter of this inquiry closed, in last month's issue, with the question: what do the new employes, taken on without any medical examination, bring with them?

They bring, of course, their need to be trained, broken in, adapted to their respective jobs. And they bring each one his personal equation.

But what else? What physical conditions—afflictions, infirmities, defects, impairments, ills and ails?

No large amount of information in this respect is available; the statistics are meager. Undoubtedly such information exists—because the number of companies using pre-employment physical examinations is considerable—but it is hidden in company files never to be made public. In relations with organized labor the question of these examinations has been a touchy subject.

Table 1 is a combination of the physical examinations—not all pre-employment, however—in eight situations, seven of them having been made with reference to employment. The first of these represents the experience of the Life Extension Institute from the examination of 100,000 adult males in the prime of life. It is still referred to as "the largest single available collection" of figurges of this kind.[10] The second, third, fourth and fifth columns of the percentages are from employee groups; the sixth is from the examination of 515 employees in a mercantile situation;[11] the seventh is definitely pre-employment,[12] and the eighth is from various sources which afforded the percentage with reference to a single condition only. This table reflects the percentages relating to those defects and disabilities which, in an applicant for employment, are more strictly "disbarment elements," than those listed in Table 2. The latter table assemblies from the same groups the percentages of physical conditions which, under controlled circumstances need not be disbarment elements.

The most interesting, because it is the most completely pre-employment, is the situation designated as seventh. It is best described in Dr. Michael Lake's own words[12]:

10. "Physical Defects," Health Practices Pamphlets No. 13, National Safety Council, 1931.

11. "The Evaluation of Physical Defects Found During Pre-Employment Examinations," DR. C. O. SAPPINGTON, *J. Indust. Hyg.*: XI, 1, p. 6, January, 1929.

12. "Value of Physical Examination," DR. MICHAEL LAKE, Medical Director, R. H. Macy & Co., New York City, *National Safety News*, April, 1935; *Industrial Medicine*, April, 1935, p. 204.

		(1) %	(2) %	(3) %	(4) %	(5) %	(6) %	(7) %	(8) %
Eyes: defective vision not correctable			18.9					1.4	
: color blindness									8.0
Ears : deafness, etc								1.0	
Genitals : varicocele		9.0	6.0	3.0	7.9		6.0		
: any venereal disease									5.7
Blood : syphilis								6.0	10.0
: high blood pressure-organic								0.6	
: arteriosclerosis		3.0	11.0						
: varicose veins		6.0	5.0	1.8			0.9	0.3	
Mentality : definite disorder									15.0
Nose, Throat : diseased tonsils, etc				9.4				2.3	
Heart : definite disease		4.0	9.5	5.9		7.0		0.4	
Hernia :		6.0	10.0	6.4			0.3	0.7	4.0
Diseases : pyorrhoea		6.0	61.0	11.1					
: anemia						6.4			
: chronic								0.6	
: general								1.2	
Previous : operations					6.8		7.2		
: serious illness					37.7		36.3		
Miscellaneous : goitre		2.0			3.6				

(1) 100,000 males (Life Extension Institute).[10]
(2) 10,000 adult male industrial workers.[10]
(3) 12,000 employees.[10]
(4) 2,731 mercantile employees.[10]
(5) 3,280 employees in manufacturing.[10]
(6) 515 employees.[11]
(7) 1,000 pre-employment examinations.[12]
(8) Miscellaneous.

Table 1. Percentages of Defects Usually Considered Disbarment Elements, Found in Employee Groups

OUT of every 1,000 unselected applicants for employment:

Sixteen would be generally below par to an extent which would make them unsatisfactory;

Two will have some extensive skin disease, one of which will be infectious;

Two or three a chronic ear disease, with marked loss of hearing in one;

Fourteen will have poor vision which cannot be corrected;

Twenty-three will have badly infected tonsils or sinuses;

Six, very bad teeth;

Seven (if they are men) a well developed hernia;

Six, some disability of the joints;

Six, high blood pressure;

Four, fairly advanced heart disease;

Twelve, if carefully examined, will be found tuberculous;

		(1) %	(2) %	(3) %	(4) %	(5) %	(6) %	(7) %	(8) %
Blood pressure	: high			12.9		18.4		0.6	24.5
	: low			2.0					
Ears	: hearing, etc		18.0			8.7			
Eyes	: vision	27.0	19.9	16.6	10.8	40.9	10.3	0.1	
Feet	: flat-foot		17.9	6.5					
	: improper mechanics				29.7		70.5		
Halitosis	:								
Lungs	: tuberculosis					1.0		1.2	2.2
	: diseases (conditions)			1.1		2.1	14.7		
Nose-Throat	: defects		70.7		12.2	17.5	2.9		
Teeth	: needing dentistry	72.0		22.1	17.3	37.9	14.7	0.6	
Temperature	: 99°	45.0			5.4		11.6		
Tonsils	: diseased conditions			9.4	11.1		12.6	2.3	
Vaccination	: none in five years						62.5		
Varicocele	:								
Varicose veins	:								
Weight	: over			3.4	3.8	25.7	4.8		
	: under			2.8	43.6	30.0	50.9		
Miscellaneous	:					22.1			
Digestive	: disorders		23.8						
Dysmenorrhoea	:				24.3				
Hemorrhoids	:	13.0	10.5	2.2					
Joints	:							0.6	
Kidneys	:					19.6			
	: albumin	22.0							
	: pus	13.0							
	: sugar	7.0							
Posture	: faulty				13.3				
Pulse	: rapid				9.8				
Skeletal system	: defects					17.0			
Skin	: diseases	10.0				8.0		0.1	
Time lost	: history of				5.1				
Tumors	: benign			1.0					

(1) 100,000 males (Life Extension Institute).[10]
(2) 10,000 adult male industrial workers.[10]
(3) 12,000 employees.[10]
(4) 2,731 mercantile employees.[10]
(5) 3,280 employees in manufacturing.[10]
(6) 515 employees.[11]
(7) 1,000 pre-employment examinations.[12]
(8) Miscellaneous.

Table 2. Percentages of Defects Having Correctable Possibilities, Found in the Same Groups

Six will have some general disease, including cancer, anemia, diabetes and epilepsy (which is present in about five men per thousand);

Three will have well developed varicose veins; and between

Twenty and 100 will have syphilis."

	(1)	(2)	(3)
Essentially free from defects	6	4	1
Minor defects only	213	160	88
Major defects	781	836	911
In need of medical care	800	965	977
Unaware of impairments	720	885	996

(1). 1,000 office workers—clerks, bookkeepers, etc.
(2). 1,000 male factory workers.
(3). 1,000 negro factory workers.

Table 3. Three Groups Examined on a Comparable Basis

In Table 2, in the sixth group, 62.5% had not been vaccinated in five years. Dr. Lake says: "For many years we have refused to employ people who have not been vaccinated against smallpox." With reference to color blindness, he comments: "Color blindness, partial or complete, is said to be present in about 8% of men and 1% of women." On tuberculosis and syphilis: "Of every thousand men examined in 1917 for the draft, 22 were found to have tuberculosis and 57 had some venereal disease. The incidence of tuberculosis has since decreased so that at the present time we would find approximately 12 out of every thousand to have the disease . . . In a recent survey of food handlers in Harlem, 10% of them were found to have syphilis." And on hernia: and joints: "In the past nine years we have rejected 386 applicants for employment because of a hernia, and 361 because of marked disability of various joints."

As to the "every 1,000 unselected applicants," he concludes: "In all there would be about 70 men whom we would reject for employment." The total of the defective conditions is in excess of 100, but, as he says: "Several of these may be found in the same person."

Commenting on the Life Extension Institute's figures, Dr. Allen D. Lazenby[13] notes that there were 27% with defective vision uncorrected by glasses, and 13% with various degrees of impaired hearing; a total of 12% had some type of abnormality of the heart, and 15% had some type of easily recognized disease of the nervous system or brain; 6% had hernia, 21% had frequent headaches and 8% complained of dizziness." And he adds: "Another study of 12,000 employees of a large manufacturing plant showed 24.5% to have blood pressures over 150, and 3.8% of these with blood pressures over 175."

STUDY of the tabulated figures discloses that the general scope and the range of detail involved in physical examinations vary widely as between the different employment situations. There is thus no basis of comparison, excepting perhaps in a few respects such as varicocele, varicose veins, heart disease, and hernia among the

		(2) %	(3) %
Abdomen	: conditions referable to	21.0	
	: conditions referable to (including hernia—16%)		19.0
Blood vessels	: significant abnormalities of, and/or of heart	31.0	
	: significant lesions of, and/or of heart		56.0
	: hypertension		25.0
Ears	: defective hearing, one or both	20.0	11.0
Extremities	: defects in, including all degrees of flat feet (36%)	48.0	
	: defects in, including all degrees of flat feet (82%)		86.0
Eyes	: some defect of, or of vision	73.0	64.0
Hernia	:	4.0	
Respiratory	: impairment in upper tract, including sinus disease, enlarged tonsils, etc.	46.0	56.0
Skin	: abnormal conditions, especially fungus infection	43.0	
	: abnormal conditions, not including any obvious parasitic lesions		67.0
Teeth	: dental defects, other than fillings	90.0	
	: deviations from the normal as to gums and		85.0
Urinary	: significant findings	15.0	19.0
Weight	: over—20 lbs. or more above standard	22.0	20.0
	: under—20 lbs. or more below standard	15.0	11.0

(2) 1000 male factory workers, examined in 1930.
(3) 1000 negro factory workers.

Table 4. Physical Defects Found in Two of the Three Groups of Table 3

	(4) %
Cardio-vascular systems impaired	82.0
Free from defects	6.7
Heart lesions, valvular (some functional)	30.0
Hearts significantly enlarged	37.0
High blood pressure	30.0
Mentality deviating from normal (largely anxiety states)	65.0

(4). 165 train dispatchers, examined in 1930.

Table 5. Developments Among Train Dispatchers

disbarment elements of Table 1, and in connection with vision and teeth in Table 2. And, further, in none of the situations does the quality of the examination sustain Dr. Marshall J. Payne's adjective *"searching."*[14]

The lists, however, made up as they are of defective conditions found when looked for, are fairly conclusive that all the conditions would be found to some extent in every group if they were sought.

This is borne out by a series of examinations cited by Dr. Carey P. McCord[15]. (Tables 3, 4 and 5). In connection with groups 1 and 2 of Table 3 Dr. McCord conducted the examinations; as to group 3 of the same table the study was made in

13. "Pre-Employment Examinations," DR. ALLEN D. LAZENBY, Chief Surgeon, Maryland Casualty Co., Baltimore, Md., *Safety Engineering*, July, 1935; *Industrial Medicine*, July, 1935, p. 385.

14. "Modern Industrial Surgery," by MARSHALL J. PAYNE, M. D., *Industrial Medicine*, March, 1935, p. 136.

15. "Industrial Hygiene for Engineers and Managers," by DR. CAREY P. MCCORD. Harper and Brothers, New York and London, 1931.

such a manner as to permit of direct comparison with the results of the first two.

Only *six* out of 1,000 office workers, *four* out of 1,000 male factory workers, and *one* out of 1,000 negro factory workers could be classed as free from defects, and even then the finding had to be qualified by the word "essentially."

On this, Dr. McCord says: "Wherever extensive systematic physical examinations are carried out on groups of workers, the significant defects are almost unbelievably numerous." There may be a reason for less truth in this statement with the word "applicants" substituted for "workers," but if there is any such reason, it is not clearly apparent. To the contrary, a comparison of group 1 in Table 1 with any other group there covered, will show plenty to sustain the slight but very significant paraphrase. And Table 4 is conclusive upon the presence of the same defects in two groups examined for the same things.

Table 5 is also one of Dr. McCord's examinations. It will qualify, to some extent, the foregoing paragraph, for, as he says: "The work of the train dispatcher is especially hazardous because of the undue mental strain connected with train movements."

The paragraph may also need to be qualified in respect of certain other special kinds of work. These, however, will be *very* special. In spite of qualifications, and as even the comparatively few figures here presented will prove, the facts are that in every group of applicants for employment there are a large number of "significant defects" to be found, and that they will be found when they are sought. The inquiry as to how significant they may be will comprise the next chapter.

Sharing the Wealth

ONE of the less conservative weekly magazines—"a journal of opinion"—publishes a table designed to show an invidious parallel between the salaries or total compensation of the presidents or chairmen of certain large corporations and the "approximate average weekly wage" in the same industry for the years 1933 and 1934. Companies to the number of 107 are listed; the total compensation of the chief officers of all of them is an average of almost exactly $60,000 a year; the average weekly wage is $21.63. The number of employees is not given as to any company; the list is exclusive of railroads, but the concerns named are all large employers.

From general knowledge the average number of employees of the concerns on this list would be conservatively stated at 2,500; it is probably actually in excess of 3,000. But at the smaller figure, if the chief officer worked for nothing and the pay he didn't receive were divided among all the employees, it would increase their average weekly wage by $.46.

In *Saturday Evening Post*, August 10, 1935, there is an article about an employer whose annual payroll of $2,000,000 was distributed among 1,000 employees in eight offices. Interested in the politico-popular resentment against high salaries, dividends, etc., he figured up that if his yearly total of executive salaries, dividends, rentals, mortgage interest and interest on loans had been divided among his employees, each would have had his pay increased by $.0175 per hour.

Operation

For Elevation of Depressed Malar Bone Fracture

By GEO. G. DAVIS, M.D., F.A.C.S.
and WALTER B. HUEY, M.D.

AN ARTICLE by Ivy and Curtis,[1] on treatment of fractures of the malar bones, recently brought to our attention, prompts the publication of a description of a still different method of replacement which has been very successfully used by us for 12 years. The method is simple, effective, and to us easier, and has the very great advantage of leaving a minimum scar which is almost imperceptible, and there is a very accurate control of the movement of the fractured bone while it is being brought into place.

Anatomy

THE malar bone, os zygomaticum, forms the prominence of the cheek, part of the outer wall of the orbit and part of the temporal and zygomatic fossae. As it is through its articulations with adjacent bones that fractures occur most frequently, it is rather important to remember that it articulates with the frontal bone by

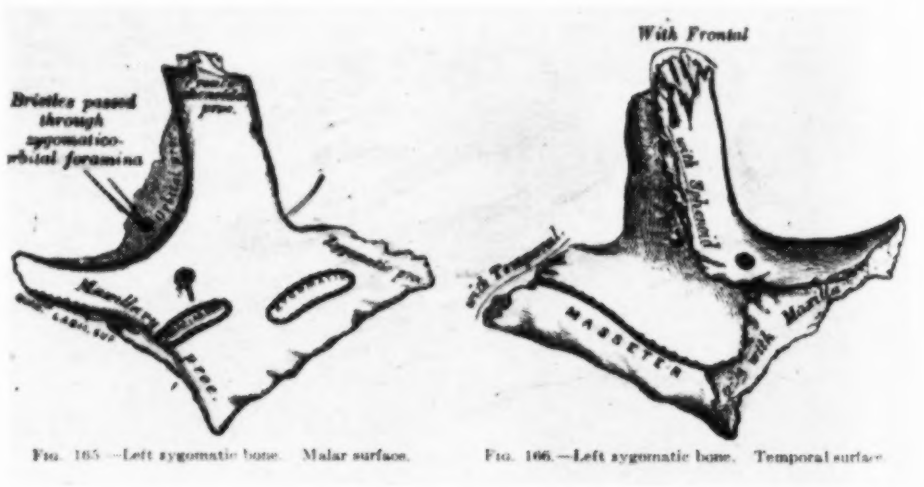

Fig. 1. Gray's Anatomy illustrates the various articulations of the malar bone

the frontal process; with the sphenoid and temporal bones on the temporal surface; with the superior maxilla by the orbital process, forming part of the outer wall and floor of the orbit. The zygomatic process joining with the zygoma completes the series of articulations. Some of the symptoms of fractures, namely, numbness of the face, lips, alveolar process, result from injury to the small branches of the superior maxillary nerve which pass through the temporo-malar canal and nerves which pass through the malar foramen, and by direct pressure upon the main trunk of the superior maxillary nerve which has palpebral, nasal, facial and labial branches. The body of the bone is composed of a rather spongy central portion with a more dense structure at the surface. It is on account of the density and toughness of the body itself that fractures usually occur through the articulations with the adjacent bones and not through the body itself as a rule.

Inasmuch as the malar bone forms the prominence of the cheek and as fractures are usually of the depressed type, fracture of this bone is usually followed by marked deformity which in cases occurring in women becomes quite important though men do not hesitate to seek relief because of this deformity.

Pathological Anatomy

THE depression of the malar bone narrows the space between the malar arch and the skull, encroaching upon the temporal and masseter muscles and causes pain and great discomfort upon movement of the lower jaw, as when eating.

Fig. 2. Rockey's demonstration of the depressed malar bone

Figs. 3 and 4. Rockey's method of elevating depressed fracture of malar bone

Depression of the malar bone causes partial or complete collapse of the antrum of Highmore and this is associated usually with hemorrhage which fills the remaining space in the antrum. This accounts for the loss of the air space in x-ray pictures of the antrum of Highmore in cases of depressed fractures of the malar bone. The depression of the malar bone carries with it that portion of the malar bone which forms a part of the floor of the orbit and this irregularity is readily felt on careful palpation, even through the greatly swollen soft tissues. The eyeball and its contents may receive injury by the violence of the blow.

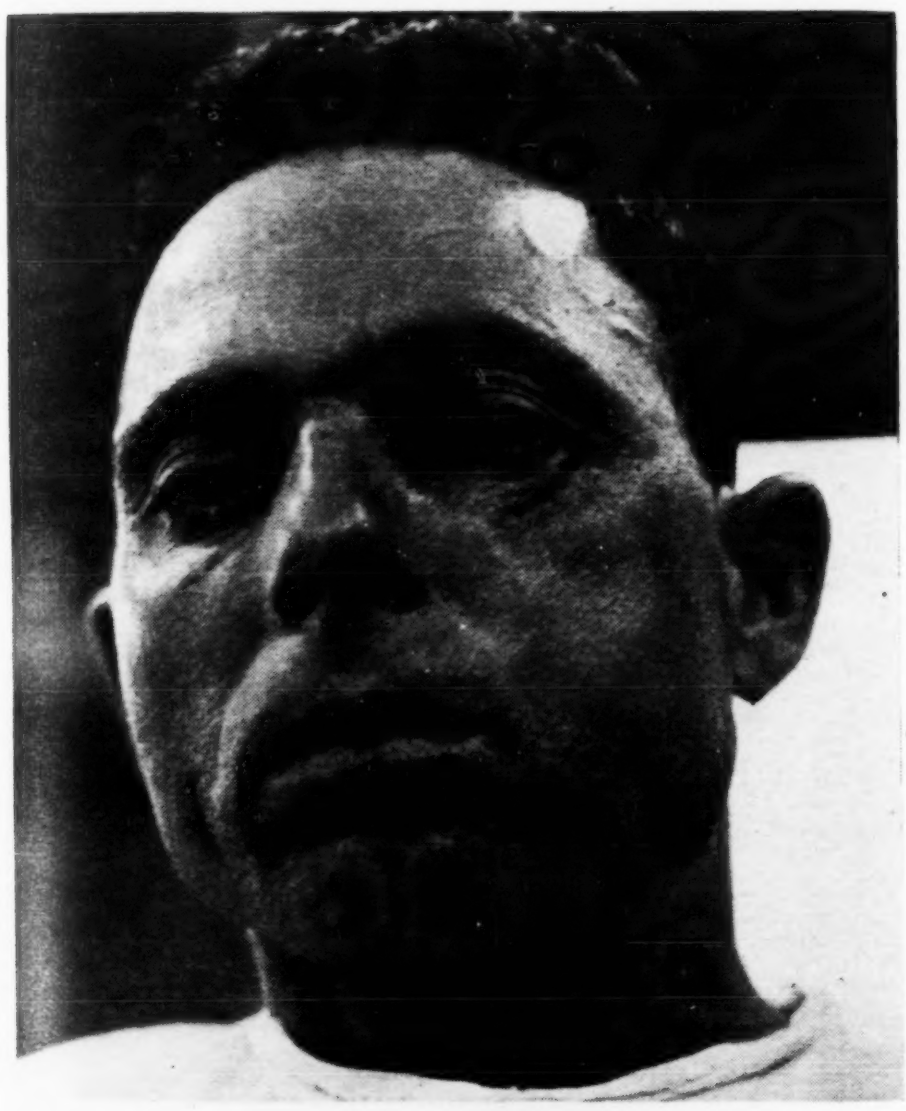

Fig. 5. Depressed fracture of left malar bone before operation. The prominence of the cheek bone is missing

Fig. 6. The return to normal of the left cheek bone after elevating the depressed malar bone

Etiology

THE force which produces the fracture always acts from without inward and is always caused by direct violence. Automobile accidents, falls, kicks and direct blows on the face may cause fractures of the malar bone. In one of our cases the fracture was caused by collision between two skaters, the head of one coming violently in contact with the cheek of the other.

Symptoms

SUBJECTIVE: There is usually a rather severe aching pain as though the bones were being wedged apart. In some cases the pain has not been a prominent feature. Numbness and pain in the teeth in the upper jaw on the same side as the fracture may occur. Attempts at open-

ing the mouth may cause pain in the temporomaxillary joint. This is more marked with the fractures of the zygomatic process. There may be subconjunctival hemorrhage, ecchymosis of the eyelids, and occasionally functional interference with movements of the eye on the affected side. Diplopia may be present as a result of this interference. Bleeding from the nose on the same side often occurs.

OBJECTIVE: Examination should include inspection, palpation, x-ray and occasionally neurological examination to determine the areas of numbness and anesthesia of the cheek, teeth and alveolar process. On inspection the most prominent feature is asymmetry of the face. Swelling and ecchymosis are usually marked and may obscure the real condition when seen early. The later disappearance of the swelling allows the depression and flatness of the cheek bone to be plainly evident. When the swelling is not marked the cheek bone is noticeably depressed. Examination by palpation should be made both from the front and from the rear, the surgeon standing behind the patient who is sitting, the thumb palpating the margin of the orbit and zygomatic process of the malar bone and with the fingers along the lower margin of the malar bone, the depression is usually evident and the thumb along the margin of the orbit can feel the irregularity or even the sharp spicule of bone at the edge of the depression. If a slender piece of wood or steel, such as a knitting needle, is placed with the lower end over the most prominent portion of the malar bone on each side, with the needle or wood passing along upward and slightly outward over the frontal bone, a marked outward deviation will be apparent on the side of the fracture. (See Fig. 2). Crepitus and mobility are rarely present.

X-RAY FINDINGS: In the x-ray there is usually an obliteration of the air shadow of the antrum of Highmore due, as stated above, either to a massive displacement of the malar bone downward into the antrum or to hemorrhage or to a combination of both. The x-ray made in an anteroposterior view may show marked separation at the junction of the malar bone with the frontal above and with the superior maxilla internally. The air shadows in the antrum often return after replacement has been accomplished.

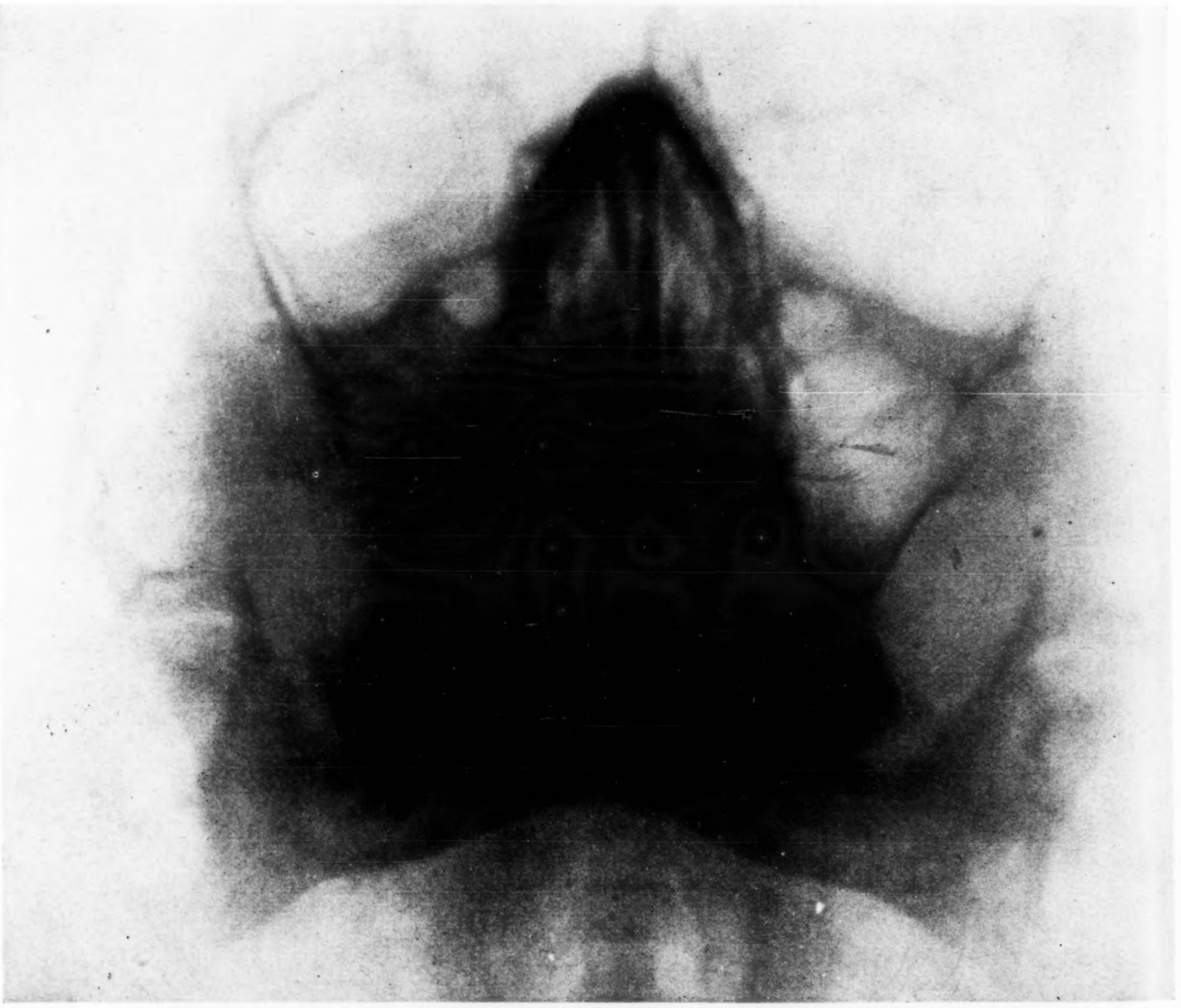

Fig. 7. This radiograph, taken before operation, the day the patient sustained a depressed fracture of the malar bone, shows the obliteration of the air space in the antrum of Highmore

Dudley Stone[3] advises placing the plate on top

of the head and the tube beneath, with the chin resting on the table.

The Titterington technic as described by Brommer[2]: the base is inclined at an angle of 23°; the patient lies on a table with the tip of the nose and chin touching it; the central ray falls at an angle of 15° footward on the center of the zygomatic arches.

Treatment

H. BROMMER[2] describes treatment by making an incision in the temporal region through the skin and fascia of the temporal muscle. A small thin elevator is inserted and pushed downward and forward to a point behind the depressed bone. Pressure on the depressed bone is exerted by turning the elevator, the end of which is bent at an angle. The method of Brommer seems similar to the method of Gillies, Kilner and Stone[3] and antedates its publication 2½ years. Roberts[4] described a method in 1928, using an instrument similar to a corkscrew firmly fixed to a handle. The fractured bone was elevated by pulling on the handle after screwing the instrument into the bone. Ivy and Curtis[1] mention the use of Roberts' method with considerable success. They also used the Gillies and Brommer methods successfully in three cases.

Report of Cases

ON MARCH 21, 1923, our first case (M.N.) was seen. The patient was a man who fell from a car, forcibly striking his cheek on a timber as he fell. He sustained a depressed fracture of the right malar bone. The depression resulting was very plainly evident as he was seen at once. It was to raise this depressed bone that the method here described was devised by Huey. The reposition of the bone was accomplished without difficulty, and no deformity whatever was apparent when he was discharged from treatment May 10, 1923. The symptoms complained of were entirely relieved immediately after the depressed bone was raised.

Fig. 8. This radiograph taken after the elevation of the depressed fracture, illustrates the bone in place and the air space in antrum of Highmore returned

The region is cleaned and prepared for operation. A stab wound is made over the dense part of the depressed bone and a hole is drilled into the bone, using a drill slightly smaller than the screw which is to be used. The foramen on the surface should be avoided. The drill selected

should be only slightly smaller than the screw so that the screw will not act as a wedge and split the bone, and yet it should be small enough so that the screw will be firmly fixed when screwed in.

The screw, which is an ordinary nickel plated round head, wood screw, is inserted into the hole made by the drill and screwed in until it is fixed firmly in place. The length of the screw should be sufficient to allow it to protrude beyond the skin slightly more than the thickness of the steel bar which is used as a lever. The lever used is a wide steel bar with a long triangular opening near one end. The head of the screw is passed through the wide end of the triangular opening and then the bar is slid along until the screw engages the sides of the triangular opening. The top surface of the steel bar presses upward on the under side of the round head of the screw. The short end of the bar is placed on the frontal region on a piece of gauze.

With the screw in the opening of the bar. (Fig. 11) raising the long end of the bar raises the screw and with it the depressed bone. Control of the amount of elevation is steady and accurate. After the bone is in its proper position the screw is removed and the wound sutured if necessary. It is often not necessary to suture the wound. There is usually no difficulty in maintaining the bone in its replaced position. No splints or retaining apparatus are necessary. The slight scar left by the stab wound soon fades and becomes invisible, as it can be placed in a natural groove of the skin.

the malar bone and cheek. Following hot applications the swelling subsided and marked depression was apparent over the malar bone. Ten days

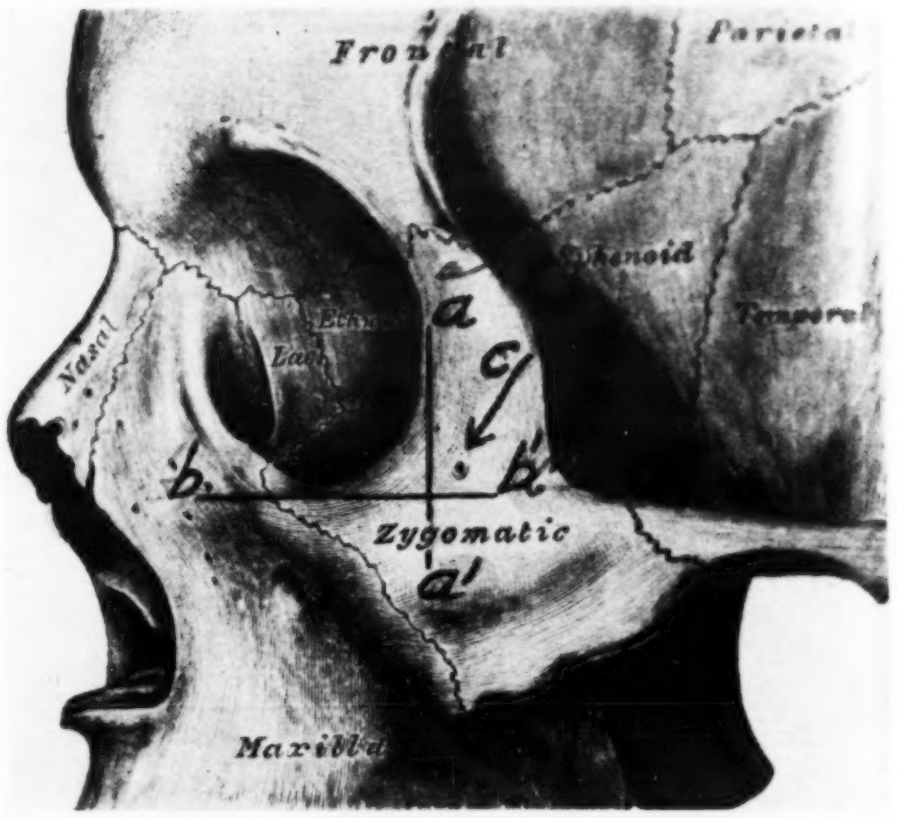

Fig. 9. The intersection of the lines a-a′ and b-b′ (drawn here on an illustration from Gray's Anatomy) indicates the point at which the screw is inserted, thus avoiding the foramen -c-

after the accident the depressed bone was raised readily, and four days later there was no visible or palpable deformity.

Since these two cases we have used this technique in our industrial accident cases with the Illinois Steel Company, and the Elgin, Joliet & Eastern railroad, and elsewhere. This method we heartily recommend.

Fig. 10. The first instrument we had. It was home made—cut out of a piece of metal

Fig. 11. This photograph shows the screw in the skull and the instrument ready for elevating the depressed malar bone. Note the excellent leverage

Fig. 12. The instrument as now used. The underside of the head of the screw is flat

A SECOND case (E.C.) was that of a young woman, 18 years of age, who received a severe contusion over the right cheek bone while skating on January 19, 1925. Another skater collided with her, bumping her cheek with his head. Operation was delayed on account of a severe laryngitis.

Examination showed marked ecchymosis and swelling of the eyelids, severe hemorrhage under the right ocular conjunctiva, marked edema over

Bibliography:

1. Ivy and Curtis, *Annals of Surgery,* Sept., 1932.
2. H. Brommer, *Der Chirurg.* 2: 606-611, July 1, 1930.
3. Gillies, Kilner and Stone. *British Journal of Surgery,* April, 1927.
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Occupation and Health

—A Review of Volume II of the Enclycopedia of Hygiene, Pathology and Social Welfare, Published in Geneva, 1934—

THIS work, comprising 1294 pages, with 207 illustrations, and covering a list of subjects from I to Z (Vol. II) has been published by the International Labour Office of Geneva, as of 1934.

The volume deals with five general types of subject matter, including industries, harmful substances, diseases, industrial employees, and specific problems of industrial health. Each cause of disease is discussed under the following headings: chemistry or biology; sources of intoxication; toxicity; statistics; pathology; demonstrations in the environment; hygiene; legislation; and the bibliography.

Occupational hazards and various environmental conditions as applied to employees are all dealt with in a similar manner.

According to the table of contents, the following subjects are treated (I to Z):

Ice cream makers; incandescent mantles industry; industrial health (propaganda), industrial hygiene (workshops), industrial lighting; industrial physiology; industrial waste waters (treatment of); infectious diseases; iodine; iron, pig iron, and steel industries; iron carbonyl; ironing; ivory.

Jewelery industry and jute.

Kapok.

Lace; lactic acid; laundries; lead; lead colours; lead compounds; lead poisoning; liftmen; lignite; lime litharge, and lithopone.

Malaria; manganese; matches (Lucifer); mechanical engineering and metal work; medical and allied professions (occupational pathology of); medical inspection of factories; men of letters, speakers, etc., mental hygiene in industry; mercury (quicksilver), mercury (compounds of); mercury (mines of); metal grinding and polishing; metallization by pulverization; methyl acetate; methyl alcohol; methyl bromide; methyl chloride; methylene chloride; mica; miners' (coalminers') diseases; miners' nystagmus; mines (hygiene in); mirrors; molybdene; mother-of-pearl; mouth and teeth (occupational affections).

Nail-works; naphthalene; naphthylamine; native labor (hygiene); nickel; nickel carbonyl; nitric acid; nitro- and amido- derivatives of benzene and homologues; nitrobenzene; nitrocellulose; nitrogen; nitroglycerine; nitrous fumes; noises.

Occupational diseases (historical review, definition and compensation, statistics, clinical examination, circulatory system, respiratory system, digestive system and general metabolism, nervous system, locomotor system, urogenital system, eyes, ear, nose and throat); occupational poisonings; odours; opium; osmium; oxalic acid; oxalyl chloride; oxygen; ozone.

Painting industry; paper mills; paraffin; paranitraniline; para-phenylendiamine; parasites; pearls (artificial); perfume and essence industry; personal hygiene; petroleum and lubricating oils; pharmaceutical chemists, druggists and herb vendors; phenols, phenylhydrazine; phosgene; phosphuretted hydrogen; phosphorus; phosphorus (amorphous or red); phosphorus (compounds of); photo-engraving; photographic industry, picric acid; pitch; plaster, plastic earths; platinum; pneumatic tools; podophillin; poisonous woods; postal, telegraphic and telephonic services; potassium; pottery industry; precious stones; primers or percussion caps; printing trades; pyridine; pyroligneous acid.

Quinine.

Radium and radioactive substances; rags; red lead; refrigerating plants; rice-field workers; roentgen ray operators (occupational pathology of); rope-works; rubber or India-rubber industry.

Salicylic acid; scavengers, road makers and road menders; school teachers; scientific management and human factor; seamen (pathology and hygiene of); selenium; seleniuretted hydrogen; shale oil industry; shoddy; silicon; silk; silos (work in); silver; skin diseases; slate; soap industry; social welfare; sodium; soldering, welding, burning or coating with lead; solvents; soot, (hygiene and physiopathology of); starch manufacture; stone industry; straw; strontium; studios (cinema); submarines; sugar (sugar-refining industry); sulphate of soda; sulphur; sulphur dioxide; sulphuretted hydrogen; sulphuric acid; sumac or sumach; superphosphate industry; syphilis (occupational).

Talc; tantalum; taxidermists; tea and coffee; telluretted hydrogen; tellurium; temperature (high and low); tetanus; tetrachlorethane; tetraethyl lead; textile industry; thallium; thorium; timber industry; tin; titanium; tobacco; toluene; tortoise shell; transport industry; trinitrotoluene; trinitroxylene; trioxybenzene; tripe and gut works; tuberculosis; tumors of occupational origin and occupational cancer; tungsten; turpentine; type founders.

Ultramarine; uranium.

Vanadium; varnishes and lacquers; ventilation; vocational guidance and selection.

Watch and clock makers; welding, autogenous; welfare workers; white lead; wine and spirit industry; women's work; woolen manufacture; wool (disinfection).

Xylene.

Zinc.

Industrial Hygiene

THERE is a special section on industrial health treating of propaganda and administrative principles. There is also a section on industrial hygiene in which is discussed the hygiene of workshops relating to the situation and exposure of buildings; floor, roof, walls, and ceiling; windows and doors; cleanliness of premises; ventilation; lighting; and temperature. Special provisions regarding hygienic conditions, including humidity and humidification; dust; steam, fumes, gas and liquids; smoke, odours, emanations; residual water and waste; noises, vibration and shocks; and also

an excellent bibliography on international legislation make up this section. Industrial lighting, industrial physiology, industrial waste waters, and infectious diseases are treated as special subjects.

As an example of the general discussion on industrial lighting, the following is taken directly from the volume:

"The problem of industrial lighting consists in ensuring, as someone has aptly expressed it, 'the hygiene of the retina.' Empiricism prevails far too often in this domain, and troubles caused by unsuitable lighting remain more numerous than they should. But it is also true that, owing to the influence of experts and hygienists, an important movement started in the United States and Great Britain is to an increasing extent attracting attention from those concerned with the existing urgency for putting into practice the fundamental principles of illumination and for adapting lighting so as to minimize fatigue. The importance of suitable lighting in industry is obvious. But employers and technicians should not be obliged to grope about to find the standard of lighting suitable for their works, and at the same time the indefiniteness which still characterizes certain regulations should be remedied. . . . Undoubtedly the problem of general lighting, and industrial lighting in particular, presents aspects which have not yet been elucidated and calls for fresh experiment. But all the same, it has been possible to fix some rules which are applicable to the daily work and, for economic and hygienic reasons, ought not to be ignored."

Lead

UNDER the subject of lead, chemical properties and industrial operations are first considered; sources of poisoning are discussed; statistics are given in tabular form and hygiene is dealt with, as is legislation in various countries. Under the subject of lead colours, chemistry, uses, dangers, hygiene and legislation are discussed. The subject of lead compounds is given special treatment, and lead poisoning occurs under a special section.

In the section on lead poisoning, the following is quoted:

"Questions of diagnosis are of special importance from the medicolegal point of view. If the symptoms which are really characteristic of lead poisoning (blue line, colic, paresis of the muscles supplied by the musculospiral nerve with the exception of the supinator longus) are not accompanied by proof of lead in the urine (even when assisted in its elimination by the administration of iodine) a definite diagnosis of lead poisoning could not be made. This position is still very important in the presence of other morbid symptoms attributable to lead but less characteristic, such as arthralgia, small atrophic kidney, etc. Such lesions, indeed, could not be proved to be due to lead, even if lead had been found in the urine. Mononucleosis, punctate basophilia, and finally presence in the red blood cells of the Jolly bodies and Cabot's rings, although not characteristic of this form of poisoning, may, however, help in confirming the diagnosis. In conclusion, it may be said that, though absorption of lead by the individual can be proved (by finding lead in the urine, and even in the blood serum by presence of a blue line, etc.), it is not possible, from the medicolegal point of view, without such investigation to assert absolutely, with the exception perhaps of cases of colic, that a given syndrome is saturnine in origin. It is not at present possible in a particular case to assert of certain symptoms that they are known to be sequelae of chronic lead poisoning (arteriosclerosis, small kidney, etc.), that lead is the cause, and still less that it is the sole cause, even though it can be proved that there has been exposure to lead absorption."

In view of recent research in the United States, there probably will be some of our own investigators who will not agree with the foregoing statements.

For example, more than one of the observers are of the opinion that proof of lead in the urine is not diagnostic of lead absorption industrially, since the intake of lead from the non-industrial sources may be sufficient to produce appreciable amounts of lead in the urine; furthermore, it has also been agreed to by various hygienists that non-industrial sources of lead may produce in the urinary content an amount of lead which is comparable to that found in those who have been industrially exposed.

A great deal of very excellent research on lead poisoning and its various ramifications has been done in the United States, but apparently no recognition has been taken of this in the bibliography of Vol. II of the Encyclopedia of Occupation and Health. At least, such references do not appear in the bibliographical lists in the various sections on lead and its compounds and on the various phases of lead poisoning (except in the section on tetraethyl lead written by Dr. Alice Hamilton).

Silicosis

SILICOSIS is not discussed as such but is included as a portion of the section on tuberculosis.

The following quotation from the discussion of silicosis may be of interest to American investigators:

"Knowledge as to this form of phthisis is based nearly entirely upon study of the statistical, clinical and pathological manifestations in industries where risk of inhaling silica dust exists. It exists in many industries; in most gold mines, tin mines, and lead mines, and generally in mining and quarrying in flint, chert, ganister, silica (quartz and quartzite) rocks, granite, millstone grit, buhrstone and sandstone; in dressing and grinding of wheels of sandstone, millstone grit, or buhrstone; in grinding articles on wheels of sandstone, millstone or buhrstone; in dressing and carving granite, sandstone, millstone grit, or buhrstone; in flint knapping, in crushing flint and quartz; in using powdered flint in the manufacture of pottery, sandpapers, certain abrasive soaps, chicken food, disinfecting powders, and silica paints; in the manufacture of refractory (ganister) bricks and other refractory materials. Silica, which although the most important, is probably not the only form of dust capable of exerting a similar influence."

Probably this idea is based upon Jones' theory of sericite as a cause of silicosis, which is included briefly in a footnote.

An excellent diagnostic tabulation is given, comparing the symptoms, radiographic appearance and blood count in simple silicosis and simple

pulmonary tuberculosis. A portion of the discussion is also devoted to legislation in which compensation regulations for tuberculosis and silicosis are given.

Occupational Diseases

A SPECIAL division of the book, comprising 140 pages, is devoted to a discussion of occupational diseases, including sections on historical review (with a brief consideration of the American contribution to industrial medicine); definition and compensation (in which there is a tabulation of a list of occupational diseases particularly relating to causes, affections, occupations or substances involved, and mentioning the national lists, as well as countries); statistics (with various occupational forms and mortality tables); physical examinations, and a discussion of specific diseases classified according to various organs and systems.

Excerpts from the general discussion of the clinical examination material provide some interesting comparisons between the work in this country and that abroad:

"Before commencing, the medical man should put a series of questions suggested by the trade or special occupation of the workman. He should ask his patient questions, remembering the action that different substances he may be called upon to handle, as well as the special proccesses used in the factory, can exercise on the system. He should never lose sight of the risks which may be suspected of affecting the health of the worker. He should be able to envisage rapidly the problems which the technical processes involve, in order to arrive at an etiological diagnosis by the same method of deductive reasoning, almost unconscious and automatic, which will lead him to form his ordinary diagnosis. . . . Today these data relating to the past history of the worker are a little too simple to suffice. A medical examination is even desirable for persons apparently healthy before commencing employment as well as periodically during its course, and especially when a transfer to other work occurs. A thorough knowledge of the family and personal history will give the medical man the necesary data for determining the adaptability of the subject's resistance to the occupation in question. A knowledge of the habits and customs of the subject which may vary considerably from the usual will enable the physician to make suggestions and give advice which together may help to start the patient on sound lines . . . Finally, it will be desirable to ask the patient if he has knowledge of any malady or symptoms analogous to those from which he is suffering amongst the members of his family or amongst his companions at work. . . ."

Summary

AS A WHOLE, the work is excellently arranged and well done, the illustrations being numerous enough to bring out the points in the text.

The volume, together with Vol. I published about four years ago, is a very useful reference work for libraries, Federal, state and city health departments, and those physicians and others who specialize in industrial health. A lot of useful information which will not be found elsewhere can be readily referred to in the two volumes of the Encyclopedia.

This work was published by the International Labour Office at Geneva, and is distributed in the United States by the World Peace Foundation, 40 Mt. Vernon St., Boston, Mass.

The price is $11.00 per volume in paper and $12.00 per volume in cloth.

—C. O. SAPPINGTON, M.D., DR.P.H.

Blood Changes

In Radiologists

ADDRESSING recently the Societe belge de radiologie, Dr. Maisin* considered the morphologic changes in the blood of radiologists. The circulating blood is not easily affected by radiations. The circulating blood in the ears of the rabbit may be irradiated for several hours without evidence of changes in the blood. On the other hand, the hematopoietic organs are very sensitive to radiations. One observes most frequently irritation of the red marrow. A permanent inversion of the white cells is observed at the same time. The relative number of the mononuclears is increased at the expense of the polymorphonuclears. If the irradiations are continued they eventually effect a persistent mild anemia, with inversion of the blood picture in favor of the mononuclears; then the anemia becomes more marked under the effects of the rays and finally takes on an aplastic form, the aplasia affecting both the red cells and the white cells. As a rule, death intervenes, with a purpuric syndrome and a noticeable diminution of the blood platelets.

The question arises as to where, in this blood picture, leukemia belongs. Leukemia must be regarded as a reactional condition due to an irritative state, whether of the lymphoid type, the myeloid type or the Blumenthal type, in which an augmentation of the red cells and of the white cells is observed.

Two Belgian radiologists have died from leukemia. Nevertheless the leukemias are relatively more rare than the aplastic anemias. Recent statistics show that 25% of the radiologists are affected with lymphoid leukemia. In 1913 Aubertin called attention to the inversion of the blood picture due to mononucleosis. Maisin, taking account of only frank cases, noted in 28 radiologists: anemia, 12 cases; leukopenia, five cases; mononucleosis, eight cases; polynucleosis, four cases; polyglobulia, six cases, marked; 12 cases, relative. The anemia is usually mild; the most marked case presented 1,800,000 erythrocytes. The author observed anemia in very young radiologists and in elderly radiologists who had been exposed to rays over a long period. Leukopenia is the most grave sign. It may disappear with suitable rest and proper precautions. Mononucleosis is of less importance. It may develop sometimes after only a few weeks of professional practice, and it has a tendency to be permanent. A suspension of practice for two months does not reestablish the normal blood picture. It persists sometimes after two or three years. It does not develop in all persons, its appearance being due to an individual susceptibility. It may disappear during infections and reappear later in a graver form.

Polynucleosis is rare. It is not pathognomonic, if there are elsewhere disorders capable of pro-

*Belgium Correspondent, *J.A.M.A.*, May 25, 1935.

voking it. It is found nearly always if there is any polyglobulia. It is an expression of irritation of the bone marrow.

Polyglobulia is found in young radiologists who are normally exposed and in elderly radiologists woh have been slightly exposed over a long period of time. The highest figure as 6,300,000 erythrocytes. Young types are lacking. If the person affected takes a rest, the figure will frequently drop to five or four million and will sometimes go below normal.

The reticulocytes — filamentous red cells — amount to about 1% in a normal person but may rise to 20%. They are an expression of an irritation of the bone marrow.

Undulant Fever

BERNARD[1] considers the differential diagnosis of this and tuberculosis and their possible association. He believes that the cases involving difficulties of differentiation may be classed in five categories:

1. Undulant fever simulating tuberculous infiltration. The principal symptoms are asthenia, pallor, emaciation and sweats beginning insidiously usually in young persons and progressing persistently with resistance to all treatment.

2. Pulmonary forms of undulant fever. These may be subdivided into an acute type of pulmonary congestion, a corticopleural type and pleurisy with effusion.

3. Undulant fever cachexia. This occurs in prolonged undulant fever when the general condition is so profoundly affected as to simulate tuberculosis.

4. Acute forms. In this type, undulant fever may be confused with miliary tuberculosis.

5. Localized types. In this group, localization in the articulations and elsewhere may resemble those which are characteristic of tuberculosis. The association of the two conditions has been confirmed by numerous observations. He concludes that the two conditions may be easily confused and may also be associated. The confusion may be clarified by careful clinical analysis and especially by blood culture, agglutination reaction and intradermal reaction. Recent epidemiologic inquiries have demonstrated the progressive frequency of undulant fever, and it is important to know that this condition produces a new group of "false tuberculosis."

Caisson Disease

FRANK reports[2] a case in which a man, aged 41, when employed at bridge construction, developed severe formication in the left hip joint. It appeared suddenly when, one day, decompression had been done somewhat too rapidly. He felt comfortable only as long as he was in the chamber. Later severe pains developed in the hip joint, and the severity of the pains fluctuated. During the third year the symptoms increased considerably and he came under the author's observation. The left hip joint was sensitive to pressure and the movements were somewhat restricted. Roentgenoscopy disclosed areas of lesser density in the head of the femur. Moreover, on the rim of the head there were excrescences so that the entire lateral surface had an irregular outline. The articular space was diminished. The region between the upper rim of the head of the femur and the neck of the femur appeared as if gnawed on. The right hip joint was free from these changes, but here too honeycomb-like areas of lesser density appeared. The seroreactions for syphilis were positive, but the roentgenologic aspects of the articular disorder did not resemble syphilitic changes. The possibility of caisson disease was taken into consideration, but no definite diagnosis was made. The patient died two years later as the result of pneumonia and pulmonary embolism. The postmortem examination of the hip joint corroborated the roentgenologic aspects, but a histologic examination of the hip joint was neglected. A recent report in the literature, which described the impairment of the hip joints in four caisson workers in whom the anamnesis and the roentgenologic aspects were similar to that of the author's case, convinced him that the patient observed by him must have had caisson disease of the hip joint. The bone lesions resemble greatly those that are observed in caisson disease of the skin (marmorations and aeremia), of the internal ear or of the spinal cord and the brain.

1. *Presse méd.*, Paris, 42:1617-1640, October 17, 1934, abstr. *J.A.M.A.*, January 12, 1935.
2. *J.A.M.A.*, 104: 1952, May 25, 1935.

Nephritis and Necrosis

BARBER cites[1] the records of five men who died as the result of working in a process in which diethylene and dioxide was used. The morbid anatomy was proved, by necropsy, to be hemorrhagic nephritis in four cases associated with central necrosis of the liver, which was proved by histologic examination in three cases. There is evidence that a few intense exposures to the chemical toxin are much more serious than repeated slight exposures. It is suggested that the kidney disease was the more serious condition and was responsible for the fatal termination. It is possible that the liver necrosis, although widespread, was compatible with recovery. The morbid anatomy and histology show such acute damage to the kidneys as to suggest one large dose of the poison absorbed from the stomach. But it was concluded that the absorption was by inhalation. The most feasible explanation is that after the process was intensified some liver necrosis was taking place day by day, unsuspected in the absence of jaundice, and that, when the toxiphylactic action of the liver failed, the poison passed on to the kidneys. In no case was there jaundice to indicate damage of the liver; but the early symptoms of the fatal illness are compared with short attacks of stomach trouble, which are attributed to sublethal doses of the poison producing some liver necrosis, from which recovery took place. The fatal illness lasted about a week, from the third day of which uremia was predominant. There is little evidence of disease from chronic poisoning, but those exposed to the chemical showed a definite increase of leukocytes, particularly the neutrophils. The absence of fatty change in the liver of the fatal cases is quite different from what is found with other known liver poisons, such as alcohol and chloroform.

1. *Guy's Hospital Reports*, London, 84:257-386, July, 1934; abstr. in *J.A.M.A.*, January 12, 1935.

Present Day Relationships

—*Between Medicine and Industry*—

by

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IN THE score of years since the beginning of the World war, industrial medicine has advanced apace. Governmental responsibility for the health and welfare of thousands of munitions workers and the emergence of military medicine to its rightful place, both served to impress the values of good scientific medicine on the minds of many who had previously given it little thought. Industrial medicine shares to some extent the prestige of government sanction which the war also gave to public health, life insurance, scientific research, and invention.

In the past 50 years, and especially the past 20, we have seen many leaders in industry equip their plants with the best of modern medical programs. The death rate of industrial workers in this country has steadily declined. Safety measures have reduced accidental death and injury in some industries from 20 to 80%. Illness and death from industrial hazards have been markedly reduced. Medical examinations of applicants for employment, periodic examinations of those already employed, correction of physical defects of the employee, industrial hospital and clinic programs, studies of fatigue and a resultant adjustment of fatiguing processes, and even the introduction of modern psychiatry into industry have been tried and proved effective.

In a study of the effectiveness of medical service in industry in 1929, the National Metal Trades Association reported:

10 employers who stated their medical department had reduced the accident frequency rate an average of 43.6%;

13 who stated their medical department had reduced compensation costs an average of 28.7%;

15 who stated the medical department had reduced absenteeism an average of 50.6%.[1]

It has been repeatedly demonstrated that the smaller industries, where efficient medical service is commonly lacking, have higher accident frequency rates and higher severity rates than the larger industries, where good medical service is available. In other words, they have more accidents and the accidents produce more disability. Average hospital stay among employees from smaller plants is 18% greater than among those from larger plants.[2]

The National Industrial Conference Board[3], in a study of 200 major industries during the depression, reports that medical services have been well maintained in those companies where they were already established.

Worthwhile as these activities have proved to be, it is a peculiar fact that even today probably less than one-fourth of the 48,000,000 workers of this country benefit from modern hygienic management of their hazardous environment. It is apparent that there still exists a serious maladjustment between medicine and industry.

Industry's Need for Medicine

THE death rate among industrial workers in this country is still greater than among the non-laboring classes. The average life span of the industrially employed is six to eight years shorter than among those in agricultural pursuits.[4] The American College of Surgeons estimates conservatively that illness costs industry eight billions of dollars a year, and accidents five billions.[5] Thirteen billions annually seems an appalling waste in times of economic stress. Less than half of it would finance the federal relief program for a year. Over and above the financial considerations, it represents an appalling waste of human life and health. It is a costly tribute to pay for a mere maladjustment between medicine and industry.

Only recently in this region we have witnessed the death of several, and the serious physical impairment of several score of workmen from acute lead poisoning. Of all the industrial poisonings, none has received more attention from medicine than lead. We have known its toxic properties for years. We have devised ways and means of preventing its poisoning human beings. We have known most of the circumstances under which it becomes dangerous, how it gains access to the body, and how to treat its manifestations once they occur.

We have also recently witnessed the death of one of the nation's most skilful divers, the death of one of his associates, and the prolonged disability of several others. They were stricken with the one truly occupational disease to which divers are exposed, "the bends." The cause and treatment of caisson disease has been well understood by medicine for many years. We regard it as largely preventable.

During the past few years there have been filed in this state hundreds of workmen's compensation claims for an occupational disease known as silicosis. It is an affection of the lungs due to the prolonged inhalation of dust containing large amounts of silica dioxide (quartz or granite dust). Progressively disabling and incurable of itself, it often leads to tuberculosis. Medicine has known with reasonable accuracy the conditions under which this disease occurs and what can be done to prevent it.

Recently a lawsuit awoke an industry to the fact that exposure to the fumes of carbon tetrachloride was harmful to its workers. They promptly discontinued its use and substituted another solvent fully as harmful.

Only a few more years ago, several women employees were discovered in an eastern watch manufacturing concern, who had been allowed for many months to finish watch dials by pointing a fine camel-hair brush between their lips and then dipping it into a luminous radium paint. Their

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* Presented, Stanford University Popular Medical Lectures, Lane Hall, San Francisco, California, March 1, 1935.

subsequent disability was fully described in the newspapers.

It is safe to say that a majority of the medium-sized and smaller industries of the country even today are placing on their payrolls physically defective applicants. Since they have failed to provide themselves with medical advice on the selection of applicants, they often hire persons declined by the medical examiner of a larger industry. The error of this procedure is not apparent until some time later when it is found that the illness and accident experience with these employees is far from profitable.

It is estimated that there are 25,000 accidental, industrial fatalities in the United States each year; 3,000,000 lost time injuries; 87,000,000 minor injuries; 900,000,000 no-injury accidents.[6] All are costly. It has been well demonstrated that the average industry can reduce its accident ratio from 20 to 80% with the introduction of modern safety procedures. Staggering as this accident loss is, the loss to industry from illness is even greater. The American College of Surgeons in a recent survey of 99 companies covering 395,000 employees concludes that absenteeism due to illness in industry is six times greater than that due to accidents.

A Medical-Industrial Maladjustment—Its Causes

IF FURTHER proof of a maladjustment between medicine and industry is needed, it is available. Let us now consider its causes.

Examination of the existing situation seems to disclose that our medical-industrial maladjustment is due to three main causes:

First, the problems presented by the smaller industries;

Second, certain faults inherent in industry;

Third, certain faults inherent in medicine.

The Smaller Industry

SEVENTY-FIVE percent of our 48,000,000 industrially employed in this country are connected with establishments employing less than 1,000 workers; 62% work in plants employing less than 500, and 47% in plants employing less than 250. A full time, specially trained, industrial hygienist can rarely make his servies pay for themselves in a group of less than 1,000 persons. His presence in such an industry, in the absence of special hazards, is often a luxury. In smaller groups the full time, specially trained physician is decidedly a luxury. This means that somewhere in the neighborhood of 36,000,000 workers in this country must either go without the benefit of modern medical supervision of working conditions, or must depend on the part time practicing physician. Too often this man is unskilled, his services are unsatisfactory, industry is unimpressed. Industry then either decides to do without, or succumbs to the blandishments of pseudo-experts whose work is still more unsatisfactory.

Dr. Carey P. McCord[7] says: "The health problems of workers entail an annual loss of $8,000,000,000. . . . Good industrial medicine is little known to the manufacturer or to the medical profession. The spurious variety has blinded both groups. The manufacturer has often failed to find much value in medical services rendered in his factory. He is unimpressed, and is turning to sources other than medical for near medical service. The greater number of services carried out in industry by these professions and trades bordering on medicine . . . are often properly within the scope of activities of the well trained physician."

The medical problems of the small industry are therefore serious, both economically and numerically. Two possible solutions are being tried. One is the method introduced by the Philadelphia Health Council whereby expert medical service is provided groups of smaller industries on a unit basis. One industrial hygienist, with his assistants and a central laboratory and central accounting system, takes care of the needs of several plants, the cost being prorated according to the number on the payroll and the hazards presented. Theoretically practical as this may be, it is apparently not successful enough to have impressed other cities. The other possible solution is a proposal recommended by the Industrial Hygiene Section of the American Public Health Association at its last meeting; namely for health departments to establish a bureau of industrial hygiene through which at least advisory health service may be given all industries in the locality regardless of size. Owing to legal restrictions in many places, it is a question whether this plan could ever provide industry with actual health service on a cost basis. On the whole, it would seem that the pressing health problems of small industry will best be solved by a remedy of the faults inherent in industry and by a willingness on the part of medicine to give skilled and sympathetic consideration to these problems.

Faults in Industry

AS TO the faults inherent in industry, these are largely beyond our province to correct. They are on their way to correction through workmen's compensation laws, legislation dealing with economic security, activities of labor, and through the real leadership of industry itself. They have to do with the older concept of industry that production, distribution, and selling are paramount over all else, and to the exclusion of all other considerations; that human materials are cheap and easily replaceable; that the labor market is glutted with those willing to risk their health and lives for the privilege of earning a living. Together with this is the natural skepticism of one expert for another whose field is totally strange, and the traditional distrust some have always shown for medicine—that doctors are primarily for women and children but not for busy men (so long as they are well).

Faults in Medicine

WE ARE more directly concerned with the faults inherent in medicine. We shall find these largely due to sociological changes with which we have not kept pace, and with rapidly changing medical problems which we have not yet attacked.

The Contract Surgeon

THERE is no doubt that we have often failed to meet the challenge presented to our profession by industry. We have been inclined to scoff at the "contract surgeon," an attitude on the part of his colleagues hardly conducive to encouragement in the development of his opportunities. We have been peculiarly slow to adapt our persons and our methods to the needs of industry. Too often we have carried the imperialistic attitude of the hospital and the clinic into industry,

and have therefore been charged with officiousness, autocracy, and impracticableness. Some of our members, at least, have seen nothing more in an industrial contract than an opportunity to increase their experience with traumatic surgery and to collect at least one account that will be paid promptly.

The Industrial Hygienist

THE industrial physician's proper place is one of trust and respect. His responsibilities must include a continuous watchfulness of the hygiene of light, ventilation, sanitation, safety, industrial poisonings, periodic health examinations of all employees, and a careful medical inspection of all applicants for employment. He should be the arbiter between employer and employee to protect the former from preventable and unjust claims, and to protect the latter from types of employment for which he is physically or mentally unsuited, and to see that he is justly compensated for unpreventable injuries arising from his employment.

These are the attitudes and skills which have impressed large industry and led to its willingness to establish medicine on a proper footing in its plants.

Part Time Industrial Physician

NOT only at present, but in all probability for many years to come, a very large proportion of our working population and of our employers must rely upon the part time industrial physician. With what training we can give him in medical school, with an alert mind and a receptive attitude, and most important, with a full appreciation of his limitations, he will carry on. At least 30 million workers, and indirectly some 45 million of their dependents, a total of nearly two-thirds of our population, must depend upon our practicing graduates for medical supervision of their working conditions, their industrial illnesses and injuries, and their protection from the hazards of industrial poisonings which neither they nor their employer recognize.

A recent survey by Dr. E. C. Dickson bears this out. Of all Stanford graduates of the past 10 years who replied to a questionnaire, 40% have engaged in some type of industrial medicine since graduation.

To Remedy the Maladjustment

AS TO the remedies for this maladjustment, they will, of course, lie in removal of the causes, part of which we have seen are inherent in industry. Our direct responsibilities lie in the correction of the causes inherent in medicine.

Research

CERTAINLY we must promote and pursue our researches into the problems of industrial health. Invention of new processes, mass production more rapid and less costly methods of dealing with raw materials, synthetic methods of manufacturing, production of larger amounts of industrial wastes and the problem of their salvage —all these combine to present an ever changing and not infrequently harmful environment to which the human body will be subjected. Only the well trained medical man can solve these intricate problems, and with the lives and health of more than half our population at stake, we must not be found wanting.

Public Enlightenment

AND when these researches are concluded, we must not be too modest in presenting them to industry. Scientific discoveries per se have saved few lives. It is their application which makes them effective. If Jenner had regarded his knowledge as a static, personal possession, we should still suffer the scourge of smallpox. It was his release of this knowledge to his medical colleagues and their release of it in turn to the public which brought smallpox under control. Similarly, public enlightenment was an additional requisite factor in the control of rabies, tuberculosis, yellow fever, malaria, diphtheria, and other diseases. So, with scientific discoveries of importance to industry. It is the duty of the part time industrial physician to be ready to apply them as he does the newer methods of diagnosis and therapy in his private practice. He must hasten to explain them in simple terms to his employer when apropos to his industry.

Adaptability

ABOVE all, those who would acquit themselves with credit in this field must be prepared to shed medicine's cloak of mystery. The industrialist is intelligent, he is accustomed to logical reasoning, and to relating cause and effect. His appreciation of medicine's offerings increases when he understands medicine's logic and its attempts to be exact. He is accustomed to receive and use the advice of technical experts, providing the expert is humble and sympathetic with the employer's problems. He may have a trade jargon of his own and be more or less familiar with the trade jargon of attorneys, engineers, chemists and the like. But, the one thing he will *not* have is an understanding of the trade jargon of medicine. He not only fails to understand it, but has a distrust for the one who uses it. We in medicine must learn, as we have in medical jurisprudence, that the display of high-sounding, technical terms before one who could not be expected to understand them is little less than a display of bad taste. It is an evidence of weakness, impetuousness, and even, in some cases, bombast. The law, engineering, and the ministry have gone much farther than we in medicine towards reserving their professional terms for conversation with their colleagues, and towards the development of simple terms to explain their meanings to persons learned in other lines.

Finally, in his relations with industry, the physician must display that adaptability in which our fathers were so skilled. In times largely past, we have prided ourselves on our ability to operate, if needs be, on the kitchen table, to diagnose without the help of the laboratory, to improvise devices and appliances for the patient far removed from the hospital. This is becoming a lost art, and with its loss has gone some of our resourcefulness.

Adaptability, not so much of our methods but of our attitudes, is a prime essential in industry. When working in industry, we must be willing to forego the prestige, the authority, and the conveniences accorded us by the hospital. We must adapt our conduct and our program to the exigencies and pressures of flying wheels, rush orders, slack seasons, cost accounting, enormous fluctu-

ations in the demands on human energy. We represent a service subservient to industry, but nevertheless of enormous value when properly conducted.

Forecast from the History of Military Medicine

THE future of industrial medicine may well follow the developmental history of military medicine, in which there appears to be an interesting set of parallel circumstances.

Military medicine seems to have started with the soothsayer's prayer, incantation, star-gazing, and magic potions. The medicine-man's life was often endangered if his advice proved wrong.

Perhaps the next stage was that of the barber-surgeon of the type of Ambroise Pare. He served the armies of King Francis in the 16th century, and apparently was as valued for his ready wit and his entertaining philosophy as for his bloodletting and leeches.

Next, we find the military surgeon chiefly a litter-bearer, bandager, and burier of the dead. A little later his chief duties would characterize him as an amputator and physiker.

Still later, and within the memory of some of us, the medical man was a tolerated military adviser, but one not to be trusted with any considerable funds or personnel and certainly not with any authority. This was largely the situation when former Surgeon-General Merritte W. Ireland entered the military service of this country in 1891.[8] Just prior to the Spanish-American war, Congress had reduced the already small medical corps so that hundreds of civilian contract surgeons were required during the war. Learning nothing from this, Congress in 1901 still further reduced the personnel and facilities of the medical department of the Army so that it was even worse off than before.

General Ireland says: "Out of this darkness, however, came light, for General O'Reilly appealed against what the medical corps called 'the crime of 1901' and after a long fight of four years, in which he was valiantly supported by the medical profession of the country, won, from the War department and from Congress, an effective reorganization and the establishment of a reserve corps, which, for the first time in our country, enabled the Surgeon-General to make intelligent and farseeing preparations for war in time of peace.

"In the great gains of this period, our sister medical service of the Navy has shared fully."

Today, we find the medical officer of the Army and the Navy cloaked with proper rank, endowed with defined and superior authority when needed, and an officer whose opinion on hygienic matters is sought and respected. The army surgeon's monthly reports are forwarded through channels to the Adjutant General of the Army, an impressive device to line officers who may be inclined to disregard their surgeon's recommendations.

In retrospect, this long and painful developmental period in military medicine might be ascribed to an interesting chain of events:

First, there was the possession of supposedly superior knowledge by the so-called medical man. To be sure, in the early days this was often little more than supposed knowledge of the occult.

Second, the fact that the physician was usually a gentleman and a scholar, whose company was agreeable.

Next came the development of bodies of knowledge and technic which proved to be of prime importance to military function.

And finally there came the development of a group of medical men who were willing to undergo discomforts foreign to their training and nature in order to adapt their science and art to the military establishment. To many of us who have worn the uniform in active service, this was no minor item. General Ireland says: "In addition, we have the administrative side of military medicine which looms so large and appears often to be so vexatious and unreasonable to the newly commissioned medical officer. He has come into a new and strange world in which he is called upon to give up that individualism which is characteristic of our profession, and find his place as a cog in a great machine. Also, he finds that the medical service, of which he has become a part, is ancillary to the line of the Army or Navy, and in order to get along well with them he must learn their ways and rules and speak their language."

Industrial medicine shows some signs of, perhaps, taking a similar developmental path. Its starting point was far beyond that of military medicine.

It will progress much faster.

We have long passed the soothsayer's stage. We are just emerging from the chaos of the bandager and physiker. Industry still classes us at times as a tolerated but unwelcome adviser. We already have superior knowledge on certain health problems which are of prime importance to the proper functions of industry.

The captain of industry, like the captain of infantry, feels a possessive pride in his own medical adviser. Even the most skeptical of captains of industry who have procured the services of a competent industrial physician will often admit that the doctor is a gentleman and a scholar whose company is agreeable.

We have already developed in this and other countries a body of medical men who are attracted by the challenge of preventable illness and premature death in industry, and are willing to forego some of the traditional physicians' prerogatives of dignity and unquestioned authority. They hope, by so doing, to render a service which only medicine can render, to the financial security and humanitarian satisfactions of the employer, as well as to give the hitherto neglected employee the full benefit of the physician's modern science and art.

It is in the pitifully small number of such men that medicine's most pressing problem, in its relations with industry, lies today. To paraphrase General Ireland: We have all too few men who are willing to learn that "the medical service of which they are a part is ancillary to the primary purposes of industry, and in order to get along with their associates, they must learn their ways and rules and speak their language."

Are we preparing our medical students to meet this responsibility? Are employers willing to provide their medical advisers with authority, compensation, and encouragement in keeping with their responsibilities?

There is another reason why industrial medicine will develop faster than military medicine. There is a vitamin present which will hasten growth. Workmen's compensation laws are now

in operation in all but four states of the Union. These tend to make even the stubborn employer feel the pinch of necessity in dollars and cents when it comes to compensating his employees for preventable accident and illness. The employers seek relief.

Some day they will learn that relief lies in the realm of competent, scientific medicine.

Conclusion

THIS day will be hastened if we prepare ourselves to render the service industry needs, to apply preventive measures promptly and energetically, to secure for industry the best of professional care for its ill and injured, to weigh carefully our recommendations, subjecting each of them to the acid test of practicability, and to bear in mind that the chief purpose of industry is production, not medical service to employees, and that unless production is profitable there can be no medical service, no employees, no employer, and no industry.

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The Radio-Ulnar Articulation

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ALTHOUGH a marked separation between the lower end of the radius and ulna is a rather infrequent condition, there are, undoubtedly, many minor changes in this articulation, which are frequently overlooked. In a large number of Colles fractures, the ulnar styloid is involved.

This, in the writer's opinion, is attributable to the fact that the triangular fibrocartilage of the wrist is one of the principal structures binding the ulna to the radius and that, unless the cartilage is broken or torn from its attachment, the ulnar styloid must, of necessity, fracture. The triangular fibrocartilage plays an important part in the making up of the arc of the proximal row of carpal bones and is, in fact, equivalent to an additional bone. Although this cartilagenous structure is not directly a part of the radio-ulnar articulation, as demonstrated by the author in an air inflation made of the wrist joints[1], nevertheless, the importance of this cartilage must be considered in discussing injuries to this joint. A schematic drawing made directly from x-ray prints might serve to refresh one's recollection of the anatomy involved (Fig. 1).

In children, one has an opportunity to study the derangements of the radio-ulnar articulation in those cases where damage to the epiphysis of the radius has materially interfered with the development of this bone. The ulna, if uninjured, may continue to develop normally. Gradually a deviation of the entire hand occurs, toward the poorly developed radial side. This deviation may become so severe as to interfere with the circulation and eventually may even produce neurological symptoms. An example of this is shown in the accompanying photograph of a child of 12 years of age (Fig. 2).

This case I finally operated upon, and the ulna was shortened in order to correct the deformity.

Fig. 1. The Anatomy Involved

In a few similar cases, the ulna was shortened by removing a portion of the bone proximal to the articular surface so as not to interfere with the joints of the wrist. The end results of shortening the ulna were, in this small series, fairly satisfactory.

A number of years ago, I reported an attempt to repair the lower ulnar-radio articulation in a

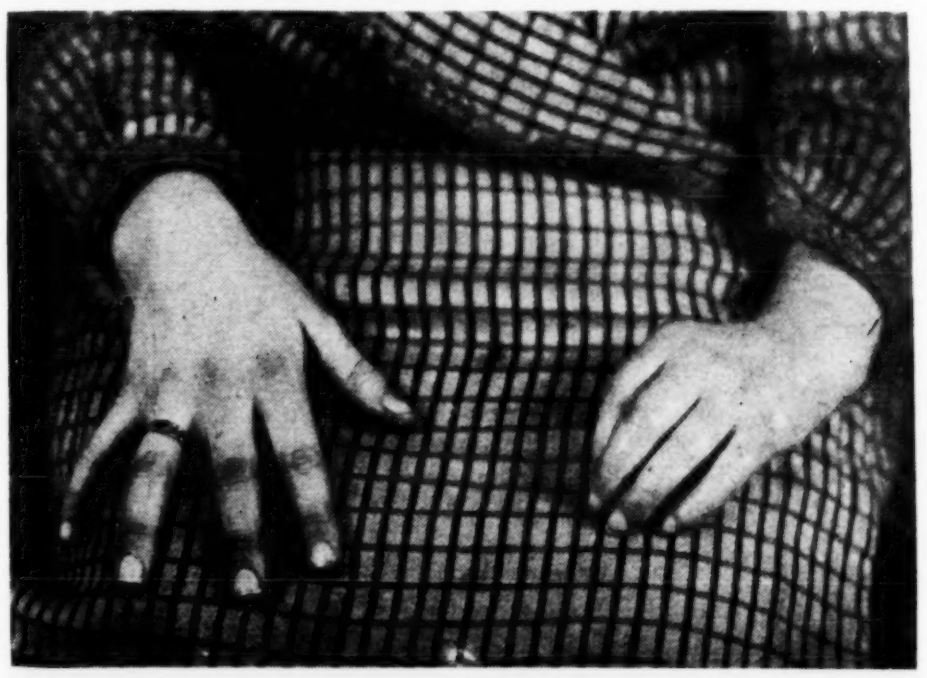

Fig. 2. Deviation of the Hand

case of recent fracture involving both the radius and ulna.[1] (Fig. 3.)

At such an operation, no attempt was made to suture or repair the triangular fibrocartilage which is so located as to make the operation on the cartilage exceedingly difficult.

In fractures involving the bones of the forearm at a level considerably above the wrist joint, the derangement of the radio-ulnar articulation has

been frequently noted, and the proper fixation of the radius with the proper adjustment of the radius has been found to materially benefit the wrist. The accompanying illustration (Fig. 4) shows a fracture of both bones of the forearm in a woman of 45 years, which resulted from an automobile collision. The patient first came to me about one year following the accident and, in the meantime, an unsatisfactory attempt had been made to wire the radius.

Because of the difficulties encountered in removing the wires and aligning the radius, the ulna was not operated upon until some time following the radial repair. The photograph, Fig. 5, showing an inlay bone graft of the radius, will, I believe, prove the point that the wrist joint was materially improved following the fixation of this bone, and that the wide separation of the ulnar-radio articulation was markedly corrected.

It is not the purpose of this article to discuss fractures of one or both bones of the forearm except in so far as this has a bearing on the title of the article. However, it must be mentioned in passing that, it is our opinion, the radius, next to the tibia, is the most common site of non-union and that metallic substances, such as wire, frequently serve no good purpose in promoting union as is demonstrated in the above case.

Before Operation After Operation

Fig. 3. Fracture Involving Radius and Ulna

Symptoms

ASIDE from the disability, severe separation of the lower radio-ulnar articulation is accompanied by objectionable deformity. This deformity is usually in the nature of a dorsal protrusion of the ulna. There usually occur periodic swellings about the wrist, obviously due to the fact that the carpal joints are irritated in their attempt to function in a deranged position. The swelling may subside with rest, but re-occurs with each attempt to put the wrist to forceful use. Along with this, there is marked loss in the grasping power of the hand. Not infrequently, where there is a fracture at a considerable distance, with non-union, the patient complains more of a disability referable to the wrist joint than to the fact that he experiences a slipping and, perhaps, a lesser degree of pain at the fracture site.

Occasionally, when the ulna and radius slip above each other, a decided clicking sensation may occur in the wrist. The condition, if untreated, in my opinion is apt to become progressively worse.

Treatment

BEFORE considering the matter of inlay bone graft from the tibia, one might think of treating this ununited fracture of the radius by means of stapling or notching. It is the writer's opinion that notching is preferable to stapling, in that stapling the end of one fragment into the medullary canal of the other does not fix rotary motion of the fragments, whereas notching would tend to prevent any rotation between the bone ends, but in order to notch or staple, one would have to remove the ebonated portion at the end of the fragments and still further shorten the bone in order to staple or notch one fragment into the other, and, where the principal symptoms were referable to the wrist because the radius was already shortened, either stapling or notching would not be satisfactory.

Only recently it occurred to me that instead of attempting to correct the condition by operating upon the ulna or by stapling or notching the radius, it might be possible to lengthen the radius, and, if the radius were placed in the proper position and in the event of a fracture of this bone, if this were satisfactorily treated, the ulna would tend to assume and remain in its normal position.

W.H., a man 35 years old, in February, 1933,

while repairing an automobile, sustained a direct violence resulting in a fracture of the middle third of the radius (Fig. 6). The case was immobilized for a satisfactory period, following which there was no bony union, as seen in the x-ray. Clinically, there appeared to be little or no union. (The difficulty in determining clinically the degree of union where a single bone of the forearm was fractured was not under-estimated). There did appear to be a fibrous union, and yet the patient described a distinct slipping sensation at the fracture site in attempting any form of rotary motion. His particular symptoms were confined entirely to the wrist. He was frankly told that the repair of the fracture could be undertaken with a reasonable degree of certainty, but that the corrections of the radio-ulnar articulation and the wrist condition were very problematic.

Fig. 4. Fracture of Both Bones of Forearm

With this understanding, the operation was done. There was found to be a marked inter-position of both fascia and muscle fibers at the site of the fracture. However, there were between the bones a few small areas of incomplete calcification, scarcely sufficient to be considered as being of any value and which could be easily separated by manipulation. The ends of the bones were markedly ebonated and the medullary canal completely closed in both the proximal and distal fragments. With the motor driven twin saws, grooves were cut in both the upper and lower fragments, being nearly a half inch in width and extending into the medullary canal. In sawing through the ebonated ends of the bones, it was difficult, even by applying water to the saws, to prevent a burning of the bone. This ebonation and closure of the medullary canal, of course, would make any subsequent union of the fragments most unlikely. The grooves were extended as far above and below the fracture site as was possible without damaging the muscles. The length of an inlay bone graft is, in my opinion, important, and also the fact that, in order to obtain true fixation, there must be at least two ties fixing the graft in place above and below the fracture site in order to prevent a rocking, as it were, of the graft, and the longer the inlay, obviously the less stress will be placed upon the sutures put at the ends of the graft in order to hold it in position.

Fig. 5. Inlay Bone Graft of the Radius

The difficulties in obtaining a sliding graft of satisfactory length in fractures in the middle of a

long bone are obvious. In addition to this, a sliding graft obtained from the fractured bone may be somewhat osteoporotic, and the desirability of obtaining fresh undiseased bone from the tibia, in my opinion, cannot be over-estimated.

From the tibia a graft was cut one and a half inches longer than the grooves in the radius, with the idea of attempting to lengthen the radius about a half inch and restore the normal relations at the wrist. We were able, by using forcible traction and placing the graft in the lower groove, to drive downward onto the graft until it was possible to sufficiently lengthen the radius and jimmy the upper end of the graft into the groove in the upper fragment. The accompanying illustration (Fig. 7) will show the restoration of the radio-ulnar articulation in this particular case.

Conclusions

IT WOULD be unfair to arrive at a definite conclusion from a single case reported, but in view of the fact that the proper fixation of fractures of one or both bones of the forearm has been known to materially benefit the function of the wrist, it seems fair to believe that the procedure described should be undertaken in attempting to correct severe displacements of the radio-ulnar articulation in cases accompanied by a fracture of the radius.

Also, that even though the condition has existed for several months, there is still the possibility of lengthening the radius in spite of the fact that it is bound to the ulna by the inter-osseous membrane, that the numerous muscles of the forearm have contracted in pulling the radius upward, and that the ulna and radius are bound together at their lower extremities by the pronator quadratus muscle, numerous powerful ligaments and the triangular fibrocartilage of the wrist.

Fig. 6. Fracture of the Middle Third of the Radius

The management of separations of the lower radio-ulnar articulation is exceedingly difficult, and description of the treatment in these conditions in the literature is not extensive.

Dr. Eldridge L. Eliason[2] reports a case—a nurse of 19 years of age—in which the ulna was fixed to the radius by means of a fascia lata sling passed around the lower end of the ulna and through a drill hole extending through the lower end of the radius.

In 1911, Dr. F. J. Coton and Dr. W. J. Brickley[3] reported a case, a laborer of 45 years of age, who, in unloading beer kegs, dislocated the joint without an associated fracture. The condition was reduced by manipulation and maintained by splintage with a satisfactory end result.

Dr. Henry Milch[4] described the use of fascia lata in binding the ulna to the radius.

Dr. Alexander Gibson[5] reports a case in which the triangular fibrocartilage was repaired, and, following the repair, the patient obtained an excellent functional result, classified as being 100%. Dr. Gibson's article in connection with the subject is an excellent one describing the condition.

Fig. 7. Restoration of Radio-Ulnar Articulation

It is, therefore, hoped that this report of a single case may promote interest in this direction and stimulate further discussion in treatment of separations or dislocations involving the lower radio-ulnar joint.

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Who's Who in I. M. & S.

—Crusader, Pioneer, Physician, Scientist, Teacher, Author, Humanitarian, Gentlewoman—

ONE OF Dr. Alice Hamilton's biographers said of her, almost a decade ago,[1] "She herself thinks that her choice of a career was almost accidental . . . When she left the genteel shelter of boarding school for a mid-western medical college, it was indeed far from her thought or ambition to achieve a position of authority in American industry, and an assistant professorship of industrial medicine at Harvard University. Even now she must often wonder . . ." Possibly she did wonder—at least until her "Nineteen Years in the Poisonous Trades"[2] crystallized for her, in a way, a perspective upon what she had accomplished. But now—having rounded out a quarter-century in the same kind of work, and being, by general acclaim, America's leading industrial toxicologist — Dr. Hamilton will undoubtedly admit that as to "her choice" there was really nothing accidental about it. Hers was a destiny—of the kind that an individual is occasionally singled out for—by the Kismet which, though it may be inscrutable and beyond understanding, yet seems to delight in exemplifying to the rest of us the two sustaining truths, first, that no opportunity in human affairs is ever lacking its one particular individual born and reared for its realization, and, second, that there is inexhaustible inspiration in what Elbert Hubbard credits to Emerson about the "better book." But whether she admits it or not, the outside point of view, the larger and less subjective perspective, will concede that when "one day, Sir Thomas Oliver's 'Dangerous Trades' came into her hands," both the coming and the thing that came were part of a pattern that is no less perfect for having been predestined.

ALICE HAMILTON

HISTORY, according to Carlyle, is "the essence of innumerable biographies." This is notable of American history in general, and especially of the formative period of the nation, when so many great lives wove their meanings and their deeds into the essential fabric of the national entity. It is also notable of American progress—of its institutions, its industries, its education and the branches of its science. When the history of industrial medicine slows down the present fast pace of its making, it will also be notable of that history.

Industrial medicine is now, as it were, just about emerging from its "13-colonies" period, just about at the beginning point of a conscious entity of its own. However strong and significant that entity may become it will never lose the impress nor outgrow the influence of certain of its greater names — its pioneers, its statesmen, and the captains of its forward movements. Alice Hamilton is one of its pioneers, but even more, she is one of its statesmen. Her story is not only a story of a science organized where there was no science; it is also—and, to her, more importantly—a story of a science immediately applied against an appalling inertia concerning its application. With the modesty of real greatness, that is where she would let it rest. But it is *her* story—because she made both the science and its application her business. It was no public crisis, open epidemic, or general plague that she uncovered and corrected. It was only an attrition of lives, so scattered and insidious that no one gave it attention. But she solved its causation—by the perfection of her scientific ability, and made it a public matter—by her consummate statesmanship. Her science, as it were, had to be sold; she sold it. And it is characteristic of her that when she found herself "looking back on the early days and meditating on the great changes that have taken place,"[2] she might have been telling some one else's story rather than her own—so little is there in it of the fact that most of the great changes owe their existence to her accomplishments.

Short of telling her story as it should be told, i.e., short of the autobiography we venture to hope she will write, any biography must be incomplete and thus, in a sense, unsatisfactory. Elizabeth Shepley Sergeant's is a very excellent portrait[1] and Dr. Hamilton's own retrospection[2] is vividly descriptive of her work. We quote extensively from both.

ALICE HAMILTON was born in New York City in February, 1869. Her Scotch-Irish grandfather had gone to Ft. Wayne, Indiana, as a young man, and there, gradually, "the large Hamiltonian

clan assembled about him: a distinguished, vivacious group of cousins, whose rich and carefully articulated speech and highly intellectual atmosphere suggested foreign origins." Neither her father, nor her mother — who was an eastern woman — believed in schooling. " 'We were expected,' writes Margaret, one of Alice's sisters, 'to know literature—French, German and English —to know history by reading all the many books about us. One did not study these subjects; they were to be read and enjoyed. Modern languages were learned by conversation and reading. Latin and mathematics were our only lessons. This curious method of education made for hard work on our part. We were determined to be educated. It made for independence of mind, as we had to answer our own questions, solve our own problems. Alice remembers one task set her by her father, when she was 14 to seek what proof of the doctrine of the Trinity she could find in the Bible. Her first piece of research! We heard all the topics of the day discussed. England, free trade, expansion, the Democratic party. We learned to fight for our education. All interest, all excitement in our restricted small-town life came to us through books and ideas.'

"This type of education would naturally have led Alice Hamilton into pure science; and this was, in fact, her starting point, in spite of her halt at Farmington." (Miss Porter School, 1887-89).

"She herself thinks that her choice of a career was almost accidental. She and her sister, Edith, who shared her 'finishing' at Miss Porter's, decided that they wanted 'a larger life,' and that it could only come through a profession. There were but two openings for women at that time, teaching and medicine. But teaching was restricted to one milieu and perhaps one sex, and Alice wanted something more. So she elected medicine and entered the school of the University of Michigan at 21" (M. D., University of Michigan, 1893).

From there she went to Germany to study bacteriology and pathology"—post-graduate work, Universities of Leipzig and Munich, 1895-96; Johns-Hopkins, 1896-97; University of Chicago, 1898-1900—having interpolated into this period "what she describes as the most exciting year of her life, an internship at the old-fashioned New England Hospital for women, in Boston." Her reaction from this experience as an intern was that she did not want to practice medicine because of the responsibilities for human life involved.

HER next act was to accept a teaching position (Professor of Pathology, 1899-1902) at the Women's Medical School of Northwestern University in Chicago, and to apply simultaneously, for a residence at Hull House. "This latter step was crucial. Once taken, the logic of her destiny was inescapable. The settlement was about eight years old at this time, and already so famous that Alice Hamilton was convinced that it could not accept so insignificant a unit as herself. Yet she had boldly to try: for something like an irresistible desire impelled her to join Jane Addams, in her then revolutionary job of bringing the constructive illumination of the age of science to those too crushed and impotent to grasp it for themselves. If the psychologists are right in maintaining that our lives move in inevitable repetitions of the same cycle, established by our early years, it seems that Alice Hamilton, in entering Hull House, was in a sense returning to an enlargement of that big, discursive, and somewhat feminized pioneer family where she had grown up. Here, too, was a remarkable group of independent women and a few clever, high-minded men; here were sustaining and varied friendships that came very close to the rounded human life; here was acute and radical discussion on every controversial subject. What Hull House added was, of course, what Alice Hamilton had found in her Boston clinic—an intense and humane concern for people, especially for those who had small chance in this world." At Hull House she developed a sort of child health center at a time when there was no such institution in Chicago, and no social service in hospitals. "Yet there was never any question of her abandoning her own scientific line in favor of 'pure settlement work.'

"She was always conscientious in her teaching, and when she left Northwestern, went, in 1903, to the Memorial Institute for Infectious Diseases, where, under Dr. Ludwig Hektoen, she undertook serious scientific research. Dr. Hektoen respected this young woman's approach. She made the utmost of the problem in hand; her results were clear, complete, logical, well-arranged, reinforced by her power of wide scientific reading in foreign tongues and fields. Her first research was on typhoid, her problem being to get actual confirmation of the then unproved hypothesis that flies carry typhoid bacilli. This work, done in connection with the practical study of a thousand homes in the Hull House district, where an epidemic was raging at the time, had highly successful results, both pragmatic and scientific; the problem was proved and the district and the city administration were 'cleaned up.'

"But Alice Hamilton was coming to realize that 'pure research' was not a field in which she could hope to make a contribution important enough to compensate for the absolute and narrow abnegation of human relationships which such a career demands. She well knew by this time that she was more a member of Miss Addams' family than she was a teacher or a research worker. The emotional center of her life was not in a laboratory or a class room. The human need at Hull House in the days of its strenuous youth was inescapable . . . .

"And then one day, an English book, Sir Thomas Oliver's 'Dangerous Trades',[3] came into her hands, and provided the key for which she had been half consciously waiting. The industrial poisons which Oliver described and the damage they were doing to working people must be as common in America as in Europe. They were going on, unchecked and unregarded, at the very gates of Hull House. And here was her specific pioneer opportunity, here was her inevitable professional choice: to bring pathological science into direct touch with the lives of working men and women.

"The opening came shortly afterwards, in 1910, through the appointment of a commission to study the industrial diseases of the state of Illinois. Alice Hamilton, becoming its special investi-

gator, made a study of all the industries using lead and arsenic in that state; and of course the vibrant, determined group-consciousness of Hull House, directed as it was towards social reconstruction, was behind her in her difficult new venture."

IT WAS in April, 1910, while I was living in Hull House," says Dr. Hamilton,[2] that I left the laboratory of bacteriological research in which I had worked on agglutinins and bactericidins and opsonins with great contentment of spirit for some seven years, and took a year's leave of absence in order to assume charge of a survey of the poisonous trades of Illinois for a commission just appointed by Gov. Deneen. Taking charge proved to mean doing much of the survey myself, and so interesting did I find it that I never went back to the laboratory, and ever since then I have been following the trail of lead, mercury, nitric acid, carbon disulphide, carbon monoxide, explosives, aniline dyes, benzol, and a long list of chemicals with complicated names which are interestingly varied in their uses and in their effects on that more or less unconscious victim, the worker. Now, 19 years later, I find myself looking back to the early days and meditating on the great changes that have taken place.

"It is almost impossible to believe that only so short a time ago American physicians could have been as ignorant about the whole subject of diseases of occupation as we actually were. We knew little and cared less. Indeed, the subject was not quite respectable in the eyes of the profession; it was felt to carry a flavor of sentimentality if not of socialism—Bolshevism had not yet been discovered; and usually if a physician were questioned about sickness in a dangerous trade he would answer that the men were suffering only from drink and their wives' poor cooking. Lead poisoning was hardly ever recognized unless palsy or colic was present, which is as if alcoholism were never admitted unless accompanied by an attack of delirium tremens.

"The Illinois survey was the first one to be initiated by a state, but already there had been an important and very successful Federal investigation of an industrial poison, white phosphorus as used in making matches. This form of poisoning, which is slow and painful and very disfiguring, had given rise to so much public protest in Europe that finally in 1906, after many unsuccessful efforts to prevent it by all sorts of hygienic measures, the important industrial countries came to an international agreement—the 'Berne Convention'—not to manufacture or import any white-phosphorus matches, but to use instead the non-poisonous sesquisulphide. . . . Shortly after, in the course of a study of the work and wages of women and children, the Federal Bureau of Labor discovered 16 cases of this unmistakable form of poisoning in match factories and commissioned John M. Andrews, now of the American Association for Labor Legislation, to make a country-wide survey of the industry. He found that over 150 cases had occurred, some very severe, requiring the removal of a lower jawbone, or an upper, or both, or the loss of an eye, and resulting in terribly disfiguring scars, sometimes in death from blood poisoning. This discovery was so startling that it was possible to enlist public support at once and the help of the largest match company, so that the Esch Law could be passed and white phosphorus banished from this country. . . . This was a great reform, but never again has so simple a situation faced us: a poison of known action used in one trade only; a safe substitute available; a form of poisoning so characteristic as to be recognized easily and so disfiguring that the victims arouse pity wherever they appear. I have often thought that if other poisons registered their effect on the human face, the work of the industrial sanitarian would be much easier.

"In spite of the revelation made by Andrews that very severe poisoning might be going on in a large industry with neither public nor physicians knowing anything about it, the spirit of ignorant optimism still prevailed when we began our Illinois study. It was pioneer work. There was practically no information to be had even with regard to the use in different trades of lead, mercury, arsenic, coal tar, benzol, wood alcohol. The factories had to be sought out, and after that came the problem of discovering whether any poisoning had resulted among the workers. In the other important industrial countries wage earners have insurance against sickness; and the records obtained in this way form a body of statistical data about the diseases of occupation and their increase under bad conditions, their decrease under stricter regulations, which is of the greatest value to the student. But in this country nothing of the sort exists. The student must pick up what information he can from all possible sources, knowing always that his facts fall far short of the truth. As I remember it, the most nearly complete figures I secured in those days were obtained by examining about 150 sanitary-ware enamellers who, luckily for me, were on strike at the time. Most of them met me in the rear room of a Polish saloon, the rest in a shack which they had turned into temporary headquarters. There, without any fear of losing their jobs, they were quite ready to let me find out whether or not they were 'leaded'. But usually the cases were picked up here and there from doctors, hospitals, priests, apothecaries, and by following clues through city tenements and workers' cottages.

THE most important poison our survey dealt with was lead, and before many months had passed we were able to declare that 77 different occupations in Illinois had given rise to lead poisoning during the two previous years. Our visits to workshops convinced us that much of this was preventable; but we had seen no other methods of manufacture and did not know what were the practical ways to prevent it. That summer there was a meeting of the International Congress of Occupational Disease in Brussels, and the Illinois Commission sent me over to attend it and to make visits to English and German lead works to see if their methods were better than ours. At that time I still believed, as did all Americans, that we had much less trade poisoning than foreign countries, and that our superiority was due to better methods of manufacture, larger and more excellent factories, and the better health of our working classes, which last depended on higher wages, better housing, and better food. But none of these assumptions

survived the actual sight of English and German plants and workmen's dwellings, nor the study of their sickness records. With all the incompleteness of our figures, I had actually collected a far larger number of cases of lead poisoning in all these trades than were recorded in the foreign reports, though the latter were based on a physical examination once a week or once a fortnight of every man employed.

"Here are some of the figures which came out from a comparative study of the same lead industry in this country, in England, and in Germany. A factory in England employing 182 men had no case of poisoning in 1910; a German factory employing 150 had two cases; an American employing 142 had 25 cases, and another with only 70 to 80 men had no less than 11 cases in two months, or a rate of 66 a year. The English statistics for 1910 showed 1,320 persons employed in white lead in Newcastle-on-Tyne with five cases of lead poisoning, one for every 264. In Illinois that year there were about 430 men in white lead work, and 63 cases (three fatal) or a rate of one for every seven.

"The form of lead poisoning was often severe and rapid in those days, in fact, we saw extreme cases of anemia, wasting, premature hardening of the arteries, palsies, and early senility such as foreign authorities were then describing as a picture out of the past, something no modern medical man could hope to see. We could even match the descriptions drawn by the great French authority in the early nineteenth century, Tanquerel des Planches. Lead convulsions, lead delirium, lead insanity were all rarities abroad; but by the end of 1911 we had brought to light no less than 52 cases of these severe forms of lead poisoning in spite of our crude and incomplete ways of gathering data.

THE Illinois study came to an end in 1911 but, instead of returning to bacteriology, I began to do similar work for the Federal Bureau of Labor which shortly after, became the Bureau of Labor Statistics of the newly formed Department of Labor."

The Sergeant account of how Dr. Hamilton "began" is so interesting as to warrant an interruption: "Mr. Neil, the United States Commissioner of Labor, went to Brussels to attend an International Congress on Industrial Hygiene, and learned there two startling things: first, that his country was years behind all the civilized world in its knowledge of the dangers of industry and of the ways to protect workers against them; second, that here was an American woman reading a paper who showed that she already knew something about the subject." Dr. Hamilton continues:

"The surveys were made now not state-by-state but trade-by-trade, following one lead trade after the other all over the country. Everywhere conditions were much the same; occupational poisoning was almost unknown over the greater part of each state, and then, suddenly, one would come upon what the epidemiologist would call an 'endemic focus,' a region in which it was so common that everyone was familiar with it in all its manifestations, perhaps a village around a lead smelter, or a pottery town making 'art pottery' with colored glazes rich in lead, or an enamelled-ware works in some crowded foreign quarter of the city.

"Perhaps you will wonder whether it was not a money loss to an employer to have so much sickness among his employees. Not necessarily, if there were no compulsory compensation for such disease; and at that time there was none. An actual money loss may be hard to prove. Changes in machinery and exhausts to carry off fumes and dust cost money, so does an adequate medical service, and, if the work is largely unskilled and there are plenty of unemployed it may easily be more economical to let things alone and trust to the community to look after the disabled workers.

"There were of course humane employers who were anxious to lessen the sickness among their lead workers, and they would appeal to physicians for advice; but so great was the ignorance on the subject among physicians at that time that the advice was often worse than useless. I found rubber gloves introduced in one dusty white lead works to protect men who were obliged in their work to breathe poisonous white lead powder all through the working day. Another physician was responsible for an elaborately equipped bath house for furnace men who worked on open smelting hearths, breathing thick fumes of lead oxide from the red-hot ore. The physician attached to a large lead smelter (he had, however, never been inside it) told me that he always advised the men to scrub their finger nails so as to avoid lead poisoning. I had just been over the plant and had seen the lifting and dumping of a huge roasting pot, the red-hot ore falling with a crash to a grating, and the men running up into the cloud of dust and fumes to break with hoes the larger pieces and push them through the grating.

"These were the men who were to escape poisoning by brushing their nails.

"With so little expert advice to follow, well-meaning employers and foremen tried to protect the men in the only way they knew, by exposing them to the poison for as short a time as possible. If there were a very bad job on hand, such as emptying white lead from drying pans with shovels, cleaning out the flues of lead furnaces, the foreman would not put his regular force on but would hire a gang for a short time, rush the work through, and discharge them, hoping that they would not have had time to get very sick. In those days a large labor turnover was considered a proper precaution, and many a foreman told me that he relied on it to prevent serious plumbism; indeed, it was practically the only protective measure used in some plants. Labor was abundant and cheap; sick men simply disappeared; their places were taken by others, and the charities paid the bill if it ever was paid. Some great lead smelters expected to lose as much as 30% of their force each monthly pay day. We know now, as foreigners had long known, that the greater the number of casual laborers in lead work the higher will be the rate of lead poisoning.

"It is hard to believe that this situation existed in plants which I know today as models in management. Back in those days I was discussing with the head of a large white-lead works a proposed law for Illinois which would provide compensation for lead poisoning. The man was amazed

at any suggestion. 'Do you mean to say,' he demanded, 'that if a man gets poisoned in my place I am to be held responsible?' That law has been in effect now some 18 years, and I am sure my friend the manager has long ago forgotten that he ever opposed it, for certainly everything possible is done in his plant to prevent harm to the men, and, if a case of poisoning develops, compensation is paid without question.

"An agent of the Federal Board of Labor has no authority at all to interfere with a workplace, no matter how bad it may be, nor even to enter it against the owners' wish; but in some way the impression obtained among manufacturers that a visit from a Washington official was a serious matter and a good impression must be made. It is pleasant to record the fact that I can remember only two large factories which refused to let me enter for fear I might find out damaging things. The others all threw open their doors, but sometimes did try to cover up what they knew was bad.

"One such experience is still very vivid in my memory. This was an enormous lead works in the Middle West where very hazardous work went on, and the men in charge were young and in a desperate hurry to make money; yet they had a pride in their plant and wanted to defend it against government critics. The day I reached the town, instead of going at once to the plant, I decided to visit the workmen's homes and talk things over with them and their wives; for often such talk would call my attention to details which, otherwise, I might miss when I was shown over the working places. It was, I think, the most depressing industrial community I have ever seen. The people were full of malaria, hookworm, and lead; the town was nothing but a group of unpainted wooden shacks, and the only sign of community organization was a water cart which made the rounds peddling water from barrels by the pail, and a drugstore with patent medicines. But the most surprising thing about my visit in the village was the fact that everybody knew I was expected. The first woman who came to the door said, 'Oh, you're the lady from Washington,' and when I asked her how she knew about me, she said, 'We all knew you was coming. They've been cleaning up for you something fierce. Why in the room where my husband works they tore out the ceiling, because they couldn't cover up the red lead. And a doctor came and looked at all the men and them that's got lead, 40 of them, has got to keep to home the day you're there.' Well, it was both irritating and amusing. Of course I knew that I had no power to cause the managers the slightest discomfort, but I was thankful they thought I had; on the other hand, I was provoked to know that I should not see the real state of things but a hastily arranged special show. The most amusing part came when I had been over the plant and sat down in the office to face four pleased and proud young men and then watched their jaws drop when I told them what I had learned in the village. There was an awful silence, but, of course, we could not help laughing, and they gaily admitted the fraud, promised to let me see the doctor's report, and to do everything they could to make the temporary reforms permanent, including a regular medical examination of the lead men.

THE lead trades continued to absorb me up to the spring of 1916, for this is by far the most widespread of the poisonous substances used in industry. Then came a new problem—munition poisons in the making of explosives; for by that time we were producing large quantities for the Allies and handling unfamiliar poisons in a pretty reckless way. High explosives are all nitrated compounds, so that quantities of nitric acid had to be produced; picric acid for the French, and trinitrotoluene for the British and the Russians called for benzol and toluol; so coke by-products plants sprang up and plants for the nitration of these compounds and for the production of gun cotton. All this involved new and serious dangers.

"Up to the Armistice it was my duty to investigate the making and loading of these explosives (loading means filling shells and mines), and it was a profoundly depressing work. It was not only the sight of men sickening and dying in the effort to produce something that would wound or kill other men like themselves (that was bad enough and certainly shook my belief in the intelligence of the human race), but it was also my helplessness to protect them against quite unnecessary dangers. After the first year we were ourselves at war, and the industrial world seemed to be given over to a sort of joyous ruthlessness, which, I think, came not so much from greed for profits as from the intoxication of bigness, big plants, reckless spending (the 'cost-plus' system made economy absurd), sudden rise to importance of mediocre people, and, of course, with it went impatience of interference and criticism. There was a small committee of physicians appointed by the War Labor Board who worked hard for the adoption of protective measures, such as England had formulated and enforced in her munition plants; but they could not prevail against the arrogance of the manufacturers, the indifference of those higher up, and the contempt of the trades unions for non-union labor. England and France, facing an emergency infinitely greater than ours, took thought to protect their munition workers, but we did not. Our physicians' committee could never get the authorities to adopt its instructions for the protection of workers against TNT, picric acid, nitrous fumes, and the rest; all it got, after months of effort, was a hygienic code, not as strict as the English, and not compulsory, which was first published some five months after the Armistice.

"The war over, I was sent to make a short excursion into the steel industry to discover something about 'gassing'—carbon monoxide poisoning — especially whether industrial cases were followed by paralyses or psychoses, as had been true of cases caused by exhaust gas from motor cars in private life . . . .

AS I LOOK back over these 19 years, especially the last 10, the changes which appear are very great and almost all are to the good. While these years have seen some of the dangers in industry grow worse (speeding up, monotony, increase in dangerous dusts in such work as sand-blasting and granite cutting, and the introduction of many new poisons), yet the improvements more than overbalance them. The 12-hour day and seven-day week are almost things of the past. Fatigue from monotony and speeding is recognized as an evil, and there are many efforts to lessen it. Poisons,

dangerous dusts, heat, and humidity are acknowledged to be the responsibility of the employers, and they are rarely entirely neglected. Indeed, it can be said that now not only the health but the contentment of the worker is a matter of real solicitude to his master. . . .

"Along with the changed attitude of the employer went an almost equally great change in the attitude of the medical profession. I think this was distinctly a war product and began with the appointment of a committee of experts to study the action of munition poisons. Ever since then research into industrial poisons, especially lead, manganese, benzol, has gone forward in all the great medical centers, and the same thing is true of the other factors affecting the health of the worker—heat, and humidity, dusts, fatigue. No country now is contributing more to this field of research than is the United States, which less than 20 years ago made so poor a showing. Much of the cost of this work has been borne by industry itself, but the results have been given to the public, regardless of what they showed . . . .

"In the last three years I have been revisiting the industries I studied in 1910 to 1914 and I have been deeply impressed, not only by the improved methods which have done away with so many dangerous sources of poisonous dusts and vapors, but also by the improved relations between management and working force. Some of the dangerous trades, such as the making of white lead and the roasting of oxides, have been really revolutionized; so has the use of mercury in making felt hats, while the rubber industry and the making of storage batteries have undergone great improvements. It is true that the painters' trade has developed new dangers, as modern speeding up has displaced the brush by the spray gun and brought in cheap and poisonous substitutes for linseed oil; but painters now are alive to these dangers and are trying to protect themselves by legislation or by agreements with master painters. It is true, also, that the granite stone cutters, especially the makers of tombstones, face a greater danger from silica dust than ever before; but here, too, efforts are being made to protect them, while less than 10 years ago the trade was energetically denying the existence of any danger at all.

"The change in mental attitude on the part of the employers is perhaps even greater than the physical changes. It is seen in almost all the establishments which I revisited. Where once there were hordes of poor immigrants moving in and out of a plant with nobody heeding, in that same plant one finds now a close personal supervision, an effort to hold the men on the job, and to keep them healthy and contented. The doctors who act as consultants or as plant physicians are now experienced men; ignorance and indifference are rare where formerly they were only too common. Take one striking instance. In the old days, which means before the war, it was the rule in a large company employing thousands of men in hazardous and poisonous work to employ physician-surgeons whose salaries were paid by money deducted from the men's pay envelopes, but in whose selection the men had no voice and over whom they had no control. The physician might, and he sometimes did, treat them with neglect and insolence which drove them to seek out doctors whom they could trust, although they were thus forced to pay twice for the care they needed. Now in these same plants the medical service is paid for by the company, and the doctor must gain the confidence and liking of the men or he cannot hold his place . . . ."

SINCE 1919 Dr. Hamilton has been Assistant Professor of Industrial Medicine, Harvard Medical School, the first—and so far the only—woman member of the conservative Harvard medical faculty.

"With the Harding Administration her governmental connection ceased, but she has, along with her Harvard professorship continued to make numerous independent investigations—as, for instance, of mercurial poison in the making of felt hats and the mining of quicksilver. But the mercury miners of California are no more interesting to her than the granite cutters of Vermont, or the potters of New Jersey. Incidentally, she has studied her subject in eight industrial countries of Europe, and knows the textile mills of Japan—everywhere seeing industry and the workers from the inside, with barriers of race broken down by a common preoccupation.

"This accomplishment, especially viewed as 'woman's work,' is staggering. The mere knowledge of varied technical processes—quite apart from the clinical picture and the pathological data—could only have been acquired by a mind that had a power-to-absorb—an objective understanding—as remarkable as its wanting-to-know—its high, adventurous curiosity. And yet it is probable that only a woman could have done Dr. Hamilton's job. Always she has had to make her way by tact, persuasion, patience, intuitive imagination, rather than by authority . . . .

"In the increasing radiation of her activity, Hull House, where she still spends several months in the year, has remained the home of her spirit. In 1915 she went through the warring countries of Europe with Miss Addams, visiting all the capitals except Petrograd in an attempt to sound the possibilities of neutral arbitration. Soon after the Armistice—before the Peace Treaty was signed—she attended with her the International Congress at Zurich of the League for Peace, in which German and Austrian women participated. In 1919, shortly after the Treaty, she made with Miss Addams — backed by Hoover and the Quakers—a first-hand study of the effect of starvation on the Germans. As a member (appointed in 1924)—the only woman member—of the Health Committee of the League of Nations, she sails every year to Geneva before her Harvard term begins . . . ."

WHAT manner of person is this who has lived so intensively in the "tense centers of modern group life: laboratories, settlements, mine corridors, factories, international congresses, medical schools, lecture platforms"; who has done so much of "walking intrepidly on narrow planks hundreds of feet above the ground alongside of vats of seething sulphuric acid; dropping down vertical ladders into the dense darkness of copper mines; crawling on hands and knees into remote stopes; listening in back rooms of saloons or union headquarters to strange tales in halting foreign tongues; listening with equal attention in polished offices to the fluent statistics of captains of industry?"

It has been her fate, in her public, humane and scientific work, "to live the very opposite of the secluded life which her personal atmosphere seems to demand." But she has made "an exquisite and easy adjustment of both sides of life—the tough and the tender, the hard work and the human relations—without sacrificing the virtues of either . . . She has neither renounced her inborn graciousness nor used it ignobly . . . In the interests of her work she has gone everywhère that a man could go—never considering herself a woman when it came to danger or fatigue—and to many places where no male scientist would have wished to penetrate—never considering herself an 'expert,' with a dignity that must be preserved. 'Wine, silver, and homespun'—so a young journalist wrote of her. She is known and loved by many kinds and conditions of Americans . . . By training a reticent scientist, she has never dramatized either her subject or her mission, though the former is highly sensational. It isn't easy to make her give herself away. When asked by a designing relative what compliment had pleased her most, she answered, 'In a metallurgical magazine, a smelting expert wrote, "here is a woman writing on metallurgy of lead who knows her job perfectly."' "

She is slender, slight, "with dusky black hair turned gray, hazel eyes serene and searching, profile of a classic gravity," and "a rich voice, drawing much, like her face and presence, from the generations behind, but with undertones of pity and irony which float out like harp notes when the springs of compassion are touched. These poignant notes seem born of the agony and fury of an age that values machines and their products: material objects like steel rails, smokeless powder, lead paint, knockless gasoline—before the brief and tender lives of men."

Her possession of a fine, exact and smooth-working mind is apparent in her books and writings. Her first book, "Industrial Poisons in the United States," was published in 1925;[4] her second, "Industrial Toxicology," in 1934;[5] and she has contributed extensively to *J. Indust. Hyg.*, and other technical publications literally too numerous to name. She has degrees, titles, honors, but she invariably signs herself "Alice Hamilton, M.D." It is enough—as if "honors and attainments meant nothing to her in themselves, nothing to her as objectives. They have not been her life, as a man's honors are his life, but by-products of her life. Her career has followed the gradual evolution of a mind that primarily sought knowledge, not conflict or domination; and finally, out of deep, earnest conviction," and with the teacher's gift of teaching, "sought to share its knowledge."

This fall she will be Emeritus at Harvard. She contemplates a variety of consultation work—her clients are governments and big businesses. It would be unlike her to retire. That is fortunate, for the ripeness of her experience and the maturity of wisdom and judgment to which she has attained will be needed as long as the destiny which has brought her thus far shall permit her to go on.

1. "Alice Hamilton, M.D., Crusader for Health in Industry,," by Elizabeth Shepley Sergeant, in *Harpers Magazine*, May, 1926, p. 763.
2. "Nineteen Years in the Poisonous Trades," by Alice Hamilton, M.D., in *Harpers Magazine*, October, 1929.
3. "Dangerous Trades," Sir Thomas Oliver, London, 1902.
4. "Industrial Poisons in the United States," Alice Hamilton, M.D., The MacMillan Co., 1925.
5. "Industrial Toxicology," Alice Hamilton, M.D., Harper, 1934.

Silicosis: Occurrence of Symptoms

THE workmen's compensation act of Connecticut provides that no proceedings for compensation may be maintained unless written notice of claim shall be given within one year from the date of the accident or from the first manifestation of an occupational disease. The employee in this case, Bremner*, claimed that when he consulted a physician in January, 1931, for a cold and a cough, he believed that he had bronchitis and contended that he did not then actually know that he was suffering from silicosis or from any other disease due to his occupation. On April 29, 1932, Bremner was forced to discontinue work, apparently because of silicosis, and filed a claim for compensation March 15, 1933. The commissioner dismissed the claim on the ground that it was not filed within one year from the date of the first manifestation of symptoms of the occupational disease, contending that such symptoms manifested themselves in January, 1931. The commissioner made no ruling on Bremner's claim that he did not actually know that he was suffering from an occupational disease until within a year prior to March 15, 1933. Bremner appealed to the superior court from the commissioner's ruling but died pending the appeal. His testatrix was substituted as plaintiff and, from a decision of the superior court sustaining the ruling of the commissioner, she appealed to the Supreme Court of Errors of Connecticut.

The legislature intended, said the latter court, that the duty of giving notice should arise only when a symptom of the disease should plainly appear, not when it was merely suspected. Furthermore, the duty to give notice was not conditioned by the legislature on actual knowledge but on the fact that the symptom of the disease manifested itself. An employee may not disregard that which is clear and plain, and if the circumstances are such that a reasonable man would clearly recognize the existence of a symptom of an occupational disease, it must be regarded as manifest in the sense of the statute. But, the court said, there must be a clear recognition of the symptom as being that of the occupational disease in question. However plain is the presence of the symptom itself, unless its relation to the particular disease also clearly appears, there cannot be said to be a manifestation of a symptom of that disease. The manifestation of a symptom of an occupational disease which sets running the time within which notice is to be given means its manifestation to the employee claiming compensation. The intent may not be imputed to the legislature to make the right of an employee to compensation depend on the adventitious knowledge of others, perhaps strangers to him, or the knowledge of a physician who deems it in the interest of his patient to conceal the actual facts from him, or the knowledge of a physician the interests of whose employer may well tempt him to keep silent as to the actual facts.

The case was therefore remanded to the superior court with directions to sustain the appeal and to return the case to the commissioner for further proceedings.

* *Bremner v. Marc Eidlitz & Son, Inc.* (Conn.) 174 A. 172; *J.A.M.A.*, 104, 1936, May 25, 1935.

Industrial Medicine in 1934

—Summary of the Year's Developments Throughout the World—

THE YEAR 1934 was marked by very important progress in research and in the consideration or adoption of measures of prevention, medical care and compensation.*

In the field of vocational guidance the need for the collaboration of medical men is being constantly emphasized.

The International Congress on Psychotechnics studied the relationship between guidance experts and medical men and passed various resolutions relative to occupational pathology, stressing the necessity for collaboration.

In Great Britain the National Advisory Council on the employment of young persons discussed the useful results in the field of placing that might be achieved by the coordination of medical, educational and industrial services.

The intervention of medical men in this movement, and above all in accident prevention, becomes indispensable as economic conditions improve, and the number of industrial accidents, naturally increases. It is currently believed that this increase is at least party explained by the fact that the re-engaged workers have to a certain extent lost their skill, being as a result of protracted privation in a lowered state of health and lacking their habitual occupational dexterity.

It was noted at the American Safety Congress (October 2) that 90% of the workers suffer from defects ranging from the slightest to the most serious types; and that 75% of these defects are capable of treatment and cure. The report there submitted also stressed the fact that a male worker classed as third grade owing to physical defects is twice as prone to accidents as one belonging to the first grade, while women workers of the third grade are nine times as prone as those belonging to the first grade. The disease forms met with were, in order of importance: eye troubles, dental affections, throat and ear troubles, deformities of the limbs, diseases of the heart and arteries, and latent venereal disease.

Industrial Pathology

LEAD POISONING: In Germany a decision of the Minister of National Economy prohibits the construction of new factories for the manufacture of products with a white lead basis.

In Victoria, Australia, a bill to amend the Factories and Shops act requires that places in which any manufacturing process involving the use of lead compounds is carried out shall be registered.

In Queensland, Australia, attention of doctors has for some years past been drawn to the number of children in hospitals suffering from acute lead poisoning, and particularly to the very high death rate from chronic nephritis among persons under 40 years of age. These morbidity and mortality rates have been attributed to the widespread use in Queensland of paints with a lead content for fences and verandas. Under the action of the sun the paint peels off, and the toxic dust is set free and carried to the mouth by the hands of children touching the painted surfaces. An official report confirmed this theory. Since the substitution of non-toxic pigments for white lead a remarkable decrease has been recorded in the number of cases of lead poisoning among children.

In Denmark the medical expert attached to the Factory Inspectorate carried out a series of investigations into cases of lead poisoning. The danger was found greatest in foundries, accumulator factories and spray painting.

Phosphorus: One case of phosphorus poisoning was reported in France, the victim being a worker who had always been in places in a chemical factory where amorphous phosphorus was being handled.

Mercury: The International Federation of Hatters passed a resolution urging the prohibition of the use of mercury.

Manganese: In Denmark the first case of poisoning affecting a worker in a dry-battery factory has been reported. Several cases have likewise been reported for the first time in France. The Correspondence Committee on Industrial Hygiene of the International Labour Office, after having considered the question of including this disease in the schedule of diseases for compensation, passed a resolution instructing the Office to continue to collect all the available information on the subject, and requesting medical experts in the various countries to make known the data already obtained and to call the attention of those directly interested to this question of occupational pathology.

Other Toxic Substances: Chronic poisoning by sulphuretted hydrogen came under discussion during the meeting of the Correspondence Committee on Industrial Hygiene, which, in consideration of the fact that the information at present available on the subject did not permit of establishing a characteristic syndrome of chonic poisoning by sulphuretted hydrogen, did not feel justified in proposing its inclusion in the international schedule of compensable diseases.

Observations as to the risks involved in the use of hydrocarbons of the aromatic series or the aliphatic series are becoming more numerous. Benzene in particular has been the subject of a series of measures: in Germany the treating of waterproof clothing with rubber solution as a home industry is prohibited; in Austria the employment of women and young persons is prohibited, and quarterly or half-yearly blood tests for detecting poisoning in the initial stages have been introduced in all establishments producing or employing benzene or its homologues, trichlorethylene, tetrachlorethane, tetrachloride of carbon, or carbon bisulphide. In France the Congress of the Postal, Telegraph and Telephone Workers' Union urged that measures of protection should be taken as regards the maintenance of telegraph poles impregnated with creosote in large quantities.

Protection against occupational risks due to the use of solvents has been provided for in Manitoba, Canada, by an order in council containing regula-

*Condensed from the Reprint of Chapter II of the "I. L. O. Year-Book, 1934-35," issued by the International Labour Office, Geneva, 1935.

tions applicable to dry-cleaning; in Greece by an Act prohibiting the employment of women and young persons in painting where certain organic coloring agents are used; and in the Canton of Geneva, Switzerland, by an order dealing with the installation of apparatus for the cleaning of clothes and the use of chlorinated hydro-carbons.

Various trade union congresses have discussed skin diseases, and the International Union of Food and Drink Workers asked the I. L. O. whether scientific reasearch into dermatitis caused by wheaten flour was sufficiently advanced to justify demanding the inclusion of this disease in the international schedule of occupational diseases.

In Great Britain the National Council of the Pottery Industry studied the question of dermatitis due to turpentine, the influence of the constitution on the outbreak of the disease, and the possible substitutes for turpentine that would be free from deleterious effects on pottery workers. It also urged the government to institute an inquiry with a view of specifying a standard of turpentine which would not affect the skin.

The high incidence of dermatitis among workers has been a matter for serious concern on the part of responsible authorities. In the United States, where the annual number of such cases is calculated roughly at 100,000, the Public Health Service has organized an extensive inquiry, the first results of which have now been published. The Correspondence Committee on Industrial Hygiene, after discussion of the question of dermatosis from the aspect of compensation (1926 and 1928), decided to resume consideration of this problem. Finally the International Congress for Dermatology has placed on its agenda skin diseases of occupational origin.

SILICOSIS: Addition of silicosis to the schedule of occupational diseases by the revision of the 1925 Convention (1934 Session of the Conference) has been followed by a wealth of studies and inquiries in various countries concerning pulmonary injuries due to dust.

In Canada the National Health Council has organized an inquiry into the incidence of silicosis.

In Czechoslovakia the Industrial Hygiene Section of the Association of Czechoslovak Physicians discussed at its first meeting the connection between silicosis and tuberculosis.

In Denmark the Medical Factory Inspectorate examined 798 porcelain workers, 361 of whom (chiefly throwers) were found on x-ray examination to be suffering from pulmonary lesions; 186 metal grinders (51 cases); a number of workers in quarries, where the risk of silicosis was found to be great among those engaged in crushing; and workers in cleaning-powder factories.

In France inquiries have been effected in coal mines and iron mines. A meeting of the National Congress of Medical Jurisprudence was devoted to pneumoconiosis among miners.

In Germany numerous studies have been published, and inquiries are organized frequently by medical factory inspectors; a discussion also took place at the meeting of the Industrial Hygiene Association on pathological anatomy in serious silicosis, the importance of the nasal filter with regard to inhaled dust, silico-tuberculosis, and draft prophylactic measures for workers in the porcelain industry, in the stone industry, in metal grinding, and for miners.

In Great Britain a report published by the Committee on Industrial Pulmonary Diseases of the Medical Research Council concludes that the examination effected did not find evidence that the inhalation of anthracite or other coal dust caused fibrosis of the lungs.

The report adds, also, that research is being pursued, not only in Great Britain and the United States, but possibly also in other countries, for the question will come up for consideration by the Correspondence Committee on Industrial Hygiene. A conference of sections of the South Wales coal industry considered the question of silicosis among miners, with particular reference to its medical aspect.

In India (Mysore) a preliminary inquiry organization by the government showed that cases of silicosis had occurred among underground workers in the Kolar gold mines.

In Italy research into silicosis, begun last year by the Institute of Medical Jurisprudence at Siena, is being continued; the Corporative Medical Inspectorate is organizing investigations in the metal industry (cleaning of castings).

In the Netherlands the Medical Inspection Service has continued the medical examination of stone-cutters and has dealt in particular with the incidence of silicosis among workers engaged in the preparation of emery powder.

In Sweden the government has instructed the Social Board and the General Directorate of Medical Services to undertake a joint inquiry into the possibility and means of carrying out the research work proposed by the International Silicosis Conference (Johannesburg, 1930). In the United States (New York) the Industrial Hygiene Division of the State Labor Department, in collaboration with a prophylactic institution, an insurance institution and the employers' and workers' organizations concerned, undertook a joint investigation among 125 granite cutters to determine the incidence of silicosis. Eleven workers were found to be free from the diseases, 83 showed fibrosis in various stages and 31 suffered from silicosis complicated by tuberculosis.

Workers' organizations everywhere have likewise directed their attention to the situation. A deputation from the Miners' Federation of New South Wales interviewed the Minister of Mines, and urged the appointment of a commission to investigate the advisability of abolishing stone-dusting in mines, and the possiblity of improving ventilation and the removal of coal dust, thus rendering stone-dusting unnecessary. The deputation recalled the fact that about 20% of the miners in a certain district were affected by pneumoconiosis, and that 40 cases were pending before the High Court, no provision being made to cover them by the compensation act. An amendment was, it was stated, under consideration for placing coal miners on the same footing as all workers suffering from the effects of stone-dusting with regard to compensation. The Executive Committee of the International Federation of Christian Miners also passed a resolution in favor of statutory compensation for silicosis.

In Belgium the National Technical Committee of the Pottery Industry likewise demanded similar recognition for those of its workers affected.

THE opinion that silicosis is due to the action of free silica has been attacked by Dr. William R. Jones, London, as the result of research which leads him to regard sericite contained in the inhaled dust as the specific cause of pulmonary fibrosis. Where sericite is not present, danger is said to be slight. It is possible—according to certain experts—that in the long course of evolution of the theories advanced in explanation of the genesis of pulmonary fibrosis, undue attention has been paid to the chemical action of dust, and that it would be advisable once again to take into account the form of the particles.

A controversial problem that is more difficult to solve is whether the injury caused by the inhaled dust containing silica or sericite can develop only in the presence of latent tuberculosis, or whether it may, on the contrary, evolve as a pure form of silicosis.

The opponents and the supporters of these two theories are still in disagreement; confronted with the new sericite theory still *sub judice,* they have been stimulated to pursue their researches and tests, which will have the distinct advantage of throwing light on the problem and stimulating the study of preventive methods, since on all sides there is proof of the serious risk from the medical point of view and the heavy economic burden of compensation.

Prevention has already been organized, moreover, even voluntarily by several industries, not only in the form of improvement of apparatus and machines, and adequate capturing and removal of dust, but also of preventive and periodical examination of the workers.

Asbestosis: This disease, very similiar to silicosis, and due to asbestos dust, has also been the subject of close study, with a view to arriving at means of diagnosis and prophylactic measures. A statement in the British House of Commons gives the number of deaths from asbestosis reported to the Home Office up to November 15, 1934, as 60. As a result of investigation, the cases in question were attributed to exposure to dust prior to the coming into force of the 1931 scheme covering the asbestos industries. An inquiry effected in 1932 in regard to risks involved in work in warehouses and certain departments of asbestos factories did not indicate the necessity for extending the regulations in force. Naturally, however, strict supervision is constantly indispensable. The Correspondence Committee on Industrial Hygiene has requested the I. L. O. to draw up a note on the asbestosis problem, and also to collect data relative to silicosis insurance with a view to making known the measures at present in force.

In the Union of South Africa the conference between representatives of the government and of the Chamber of Mines has had the effect of furthering the employment of silicotic beneficiaries in suitable occupations—especially in surface occupations—on the mines, and 1,100 of these workers in the ante-primary and primary stage have in this manner found employment in 1934.

Anthrax: In France 23 cases of anthrax were reported in 1933, nine of them in the hide and leather industry, 13 in the woollen industry, and one in the horsehair industry; 20 were cases of malignant pustule; three of œdema. Two of the cases were fatal. Cases of anthrax by goat-hair of foreign origin occurred in Great Britain; an order in council requiring all such hair to be disinfected was promulgated early in 1935.

Ankylostomiasis, etc.: Notification, prophylaxis, and free treatment of ankylostomiasis are provided for by the Social Insurance bill in the Argentine Republic. Compensation was made legal during 1934 in the Union of South Africa, Kedah and Bechuanaland. In Italy the prevention of malaria among workers engaged in land reclamation was made the subject of provisions, which deal also with compensation (already outlined in 1933) in serious and fatal cases. The Pan-American Health Conference discussed measures to be taken in the campaign against ankylostomiasis and malaria. Ictero-haemorrhagic spirochetosis (Weil's disease) has been reported as affecting a number of workers engaged in sewers, in sugarcane growing, and in draining land; the question has therefore arisen whether this disease should not be compensated as an occupational disease.

Cancer: In Great Britain the efforts of Dr. Twort, Director of the Cancer Research Laboratory of the Manchester Cancer Committee, which has for long been engaged in reseach with a view to discovering measures for preventing cancer due to mineral oil used by mule spinners in the cotton industry, have finally been crowned with success. It is stated to be possible henceforth to advise employers in the cotton industry and those in other industries using mineral lubricating oils as to which oils are or are not carcinogenic, and to place on the market a product fulfilling technical requirements which will not cause the serious damage so far encountered. Dr. Twort's research has also enabled him to make certain observations, within fairly wide limits, in regard to factors favoring the production of cancer: constitution, pigmentation of the skin, sex, weight, etc. Future research will be devoted to a study of tar with a view to discovering here, too, a non-carcinogenic product. This work has been to some extent facilitated by the results obtained by other English experts, according to whom certain cyclic carbides and their derivatives possess carcinogenic action on the animal organism. Studies by several scientific institutions confirm and impart ever-increasing precision to these observations, and some light is thus thrown on the obscure problem of cancer.

Tuberculosis: While it is true that a slow and obvious improvement may be recorded in the incidence of tuberculosis, it must be remembered that such improvement is to be attributed to the progress of health legislation, more particularly in its industrial aspect. Available statistics show that tuberculosis is undoubtedly stimulated in its development by the phenomena accompanying puberty and aggravated by occupational or physiological conditions (pregnancy, etc.) or social conditions (under-nourishment, bad housing, etc.). Tuberculosis more particularly affects men in urban areas and in industries where working conditions are less hygenic, and the rate is highest for the age-group over 35—especially among unskilled workers and employees. Mortality among women is highest in rural districts where the standard of housing and nourishment is low, and where women have to assume the double burden of field work and domestic work. The mortaility rate for the two sexes tends to become closer as

industry extends into the agricultural areas. The campaign against tuberculosis now has several very effective weapons at its disposal: knowledge of epidemiology, greater immunity of the population, improvement of health conditions in industry, shorter working hours, supervision in unhealthy industries, good medical organization, and general prophylactic measures.

Medical Assistance

THE importance of having a health service in factories and, more especially, its great utility in the campaign against wastage among workers is being more and more widely recognized. It is unfortunately impossible to demonstrate the advantages of a well-organized medical service statistically; the figures for lost time in factories with and without a medical service are not very numerous. It has been estimated, however, that British industry loses 29 million working weeks annually through absences of workers.

Medical services, though well organized in large-scale industry, are certainly less so in medium-sized and small-scale industries, and it is precisely towards the discovery of a practical method of organizing them for the latter that efforts are tending at present.

In the Argentine the president recommended the approval of a bill concerning the building of a clinic at Buenos Aires; a bill introduced in November would make it compulsory for all industrial and agricultural undertakings, shops and offices to have a first aid box.

In Victoria, Australia, a bill provides for the compulsory equipment of an ambulance room in charge of a qualified person in factories where upwards of 600 workers are employed, or upwards of 300 in the case of work of a hazardous nature.

In Germany various authorities have demanded that a factory doctor be attached to all establishments with a view to assuring the employees daily medical care.

In Hungary the National Social Insurance Institution opened at its central office a dispensary for periodical medical examinations of workers exposed to the risk of lead poisoning (every two years for printers, painters in the building trade and plumbers; every six to 12 months for other occupational categories).

A large clinic comprising all branches of clinical research and capable of treating 30,000 workers was opened in Italy, in the industrial district of Sesto S. Giovanni (Millan).

In Nicaragua a draft labour code treats of medical care and first aid in factories.

In Poland the First Congress of Safety Engineers (December) declared itself in favor of the organization of first aid in industries.

In Turkey a labor code in preparation will contain measures of protection for workers, including a permanent medical service for all factories employing upwards of 100 workers, while those employing under that number will be required to make arrangements with a doctor in private practice.

In the United States, in Maryland, the physical examination of sub-standard workers is prescribed in specified industries with a view of determining the extent to which physical handicaps or infirmities constitute a disability for certain industrial operations.

Hygiene

NUMEROUS new recommendations on general hygiene were made throughout 1934.

In Germany the activities of the Society for Scientific Lighting demonstrate the influence of various factors (temperatures, radiation) on efficiency, and point to the necessity for adaptation of lighting to different classes of work.

In several countries proposals have been made to attenuate and suppress noise. This problem is becoming more and more urgent and demands the collaboration of architects, engineers and health authorities with a view to avoiding not only aural injuries but also nervous troubles, at times of the most serious order.

A report on aural injuries due to accidents was read at the French Ear, Nose and Throat Congress; and a report on occupational damage to hearing will be presented at the forthcoming Italian Congress on Occupational Diseases.

Hygiene problems affecting certain categories of workers are receiving attention. Industrial hygiene should, it is held, occupy a much more important place than it has done heretofore in the program of legislation affecting craftsmen: It is not sufficient to organize a simple scheme of medical care for diseases designated "craftsmen's diseases", unless at the same time adequate prophylactic measures are applied. Similarly, attention is being directed to the protection of home workers handling toxic substances, especially solvents.

Workers' canteens were the subject of discussion in the Argentine at the First National Social Welfare Conference and in the U.S.S.R. at the Conference of Heavy Industry, where they were described as the most practical means of securing satisfactory nutrition of workers.

Hygiene in Various Occupations

IN FRANCE the Shipbuilders' Association organized an inquiry into the risk of poisoning from soldering galvanized sheet iron and it was found that cases of this type are very infrequent, and that simple methods of prevention suffice.

Railways: An inquiry into the incidence of heart disease among railway employees was carried out in the Netherlands.

X-rays: The protection of employees working with x-rays and radioactive substances, which was the subject of special recommendations (1921, 1923 and 1927) by the British X-rays and Radium Protection committee, again came under consideration in the fourth report of the committee, which advocates measures connected with working hours and working conditions. In France a decree and orders dealing with the protection of workers in contact with radioactive substances and x-rays were issued.

Salaried Employees: That hygiene in offices should be made subject to legislation dealing with the protection and safety of workers and should be strictly supervised by the labor inspectors and medical inspectors was urged by the International Confederation of Professional Workers.

Legislation: In the United States new basic labor codes have been drawn up by the delegates of 39 states, who met at the Conference on Labor Legislation. These take account, not only of the "minimum" in regard to conditions of labor, but

also of the "optimum". For example, during the discussion of the report on industrial hygiene, it was suggested that the separate states should be empowered to establish regulations calculated to improve safety and health conditions (temperature, humidity, cubic air space, removal of dust, fumes and gases, etc.), and that the measures in question should be periodically revised.

A similar aim led to the drafting of the I. L. O. publication entitled "Standard Code of Industrial Hygiene", which appeared during the year and met with a most favorable reception among those concerned, that is to say, employees and employers, more especially in those countries which are at present drawing up labor legislation.

In Mexico the health code of August 20, 1934, details hygiene measures connected with migration, with labor in general and with certain occupational categories.

In Peru a draft labor code provides for industrial hygiene measures; regulations of October 19, 1934, deal with medical examination on engagement and periodically during employment.

In Siam legislation is being drafted concerning the health of workers.

In the United States an Occupational Hygiene Division was set up within the Department of Labor and Industry of Massachusetts.

In Uruguay the minister of public health was empowered to issue regulations governing conditions of work in industrial establishments.

Compensation for Industrial Diseases

NOT only did the American Conference of Labor Legislation propose the definition of injuries to include occupational diseases, so that the victims of all such diseases may claim compensation, but scientists, both in Europe and America, likewise reiterated their demands for full compensation for exposure to "occupational risk."

The International Labour Conference, having adopted the conclusions of its committee on Occupational Diseases, voted by 104 votes to 11 for the extension of the 1925 convention to include:

Silicosis with or without pulmonary tuberculosis, provided that silicosis is an essential factor causing resultant incapacity or death;

Phosphorus poisoning by phosphorus or its compounds and its sequelae;

Arsenic poisoning by arsenic or its compounds, and its sequelae;

Poisoning by benzene or its homologues, their nitro- and amido- derivatives, and its sequelae;

Poisoning by the halogen derivatives of hydrocarbons of the aliphatic series;

Pathological manifestations due to (a) radium and other radioactive substances, (b) x-rays;

Primary epitheliomatous cancer of the skin;

when such occur in industries or processes corresponding to those enumerated in the schedule.

Further, the conference adopted by 72 votes to one a resolution stressing the fact that compensation for silicosis should not be considered apart from prohylactic measures (prevention of dust), that preliminary and periodical medical examination (for exposure to silica) were necessary, that diagnosis and certification of the disease should be exclusively in the hands of specially qualified medical men, and that a central controlling body should be set up in each country. The resolution also called for special investigation into the incidence of silicosis, as well as for further scientific and clinical research on the subject.

A recommendation to the governing body of the I.L.O. proposed adding ankylostomiasis and poisoning by carbon bisulphide to the new schedule.

In Queensland (Australia) regulations provide for compensation for lead poisoning in the Mount Isa district; one order in council added Weil's disease to the list of diseases covered by workmen's compensation legislation, another added dermatitis, due to x-rays, and cancer of the skin.

In Bechuanaland a proclamation provides for compensation for silicosis and tuberculosis in mines, ankylostomiasis, cyanide rash, lead poisoning and mercury poisoning.

In Brazil a decree deals with compensation for certain diseases, a list of which will be published by the competent authority.

In Canada measures for the Province of Ontario relative to silicosis cover also pneumoconiosis and stone cutters' or grinders' phthisis. In Saskatchewan an amendment adds to the schedule dermatitis venenata.

In Ceylon an ordinance on the lines of the Indian scheme, provides compensation for diseases due to lead, phosphorus, mercury, arsenic, chrome ulceration, and compressed-air diseases.

Costa Rica issued regulation, under the act of 1925, classifying as accidents for purposes of compensation occupational diseases contracted as an immediate, direct and indubitable result of employment.

In France draft resolutions were submitted to parliament inviting the government to extend insurance for occupational diseases to cover silicosis or pulmonary diseases due to the absorption of siliceous, calcareous or argillaceous dust.

In Great Britain an amendment of the Silicosis and Asbestosis (Medical Arrangements) Scheme alters the conditions governing medical examination on engagement for certain operations; another amendment extends compensation for silicosis to "any operation underground in any coal mine"; and, finally, an order adds to the schedule in force poisoning by diethylene dioxide (dioxan) or its sequelae.

In the Irish Free State the act of March 22 and the order of July 28, require compensation for the following diseases: anthrax; lead poisoning; mercury poisoning; phosphorus poisoning; arsenic poisoning; ankylostomiasis; poisoning by benzene and its homologues, by nitrous fumes; epitheliomatous cancer of the skin due to tar and mineral oils; glass-worker's cataract; cataract caused by exposure to rays from molten or red-hot metal; poisoning by nitro- and amido- derivatives of benzene, by dinitrophenol, by substances used as or in conjunction with a solvent for acetate of cellulose (dope poisoning), by tetrachlorethane, by carbon bisulphide, by nickel carbonyl, by gonioma kamassi (African boxwood), by manganese; ulceration of the skin produced by dust or liquids; ulceration of the mucous membrane of the nose or mouth caused by dust; ulceration of the corneal surface of the eye due to tar, pitch, bitumen, mineral oil or paraffin or any compound, product or residue of these substances; chrome ulceration; scrotal epithelioma (chimneysweep's cancer); compressed-air illness; miner's nystagmus; subcutaneous cellulitis of the hand, knee or elbow; inflammation of the synovial lining of the wrist joint and tendon sheaths; glanders; telegraphist's cramp; writer's cramp; twister's cramp; inflam-

mation, ulceration or cancer of the skin due to x-rays or radioactive substances; a localized new growth of the skin, papillomatous or keratotic, due to mineral oil affecting mule spinners. The provisions of the British Silicosis act of 1918 are likewise included in the new act.

In Greece the social insurance act of October 10, 1934, repeals the 1932 act and provides compensation for the diseases listed in the 1925 convention.

In Italy the compensation act of 1929 came into force on July 1, 1934.

In the unfederated Malay State of Johore an enactment of October 17, 1934, provides for compensation for diseases due to lead, phosphorus, mercury, arsenic, benzene and its homologues, and chrome.

In Kedah the act of June 30, 1934, and the notification of September 8, 1934, extend compensation for industrial accidents to cover diseases due to lead, phosphorus, mercury, arsenic and benzene, as well as ulceration due to chrome and its sequelae.

In Malta compensation is provided in the case of lead poisoning, inflammation and ulceration of the skin and mucous membranes produced by dust, liquids, vapours and other agents, and inflammation of the joints due to repeated trauma.

In Peru a draft labor code provides for insurance against occupational diseases; compensation for miner's pneumoconiosis was introduced at the end of 1934.

In Rumania a bill on accident compensation contains the schedule of the 1925 convention.

In the Union of South Africa new acts cover ankylostomiasis among workers other than Asiatic and native workers employed in mines, and empower the minister to consider extension to other diseases; amend the provisions in force relative to compensation for silicosis, and in particular maintain under certain conditions the right to compensation for silicosis in the case of miners who do not give up their work; create a special indemnity fund for silicotic miners and necessitous dependants who are no longer entitled to compensation allowances, and provide that certain underground operations may, on the advice of the Medical Bureau, be authorized as non-dangerous for miners formerly pensioned off and now recognized as free from the disease. These measures are intended to meet the situation created by the unemployment of silicotic miners.

In the United States the act of 1930 for the State of Kentucky, amended in 1934, provides compensation for cases of disease or death due to inhalation of toxic gases and fumes in mines, as well as those due to the inhalation of any gas. Further, it makes proposals for an agreement between employers and employed as to a scheme of voluntary insurance against silicosis in the glass industry, quarries, mines and the production and handling of sand. In Massachusetts a commission appointed in 1933 to carry out an investigation into the incidence of occupational diseases furnished in February, 1934, a very full report, which in conclusion calls for a series of preventive measures and for compensation, more particularly for respiratory diseases due to dust. In New York an act which came into force on September 1, 1934, extends compensation to dermatitis due to the use of brick, cement, lime, concrete or mortar, etc. In Pennsylvania a committee of inquiry submitted a report in 1934 recommending special compensation legislation. In Wisconsin the definition of the term "accident" has been amended by the addition of the words "mental or physical harm." A committee set up by employers to study silicosis with a view to compensation under the accident compensation act proposed that the schedule of risks covered should include diseases caused by silica dusts and other harmful or toxic dusts.

In Uruguay the insurance scheme for occupational diseases now covers lead poisoning and mercury poisoning; orders may be issued adding other diseases to the schedule.

STATISTICS: It would be desirable to include statistics of occupational diseases notified or compensated, at least in those countries which publish such statistics in their periodical reports. For this first attempt, however, all that can be given are the figures which reached the office in time for the drafting of this section of the Year-Book. (See the tables).

	Austria[1]	Czecho-slovakia[2]	Germany[1]	Hungary[1]	Poland[1]	Switzer-land[2]		
Anthrax	3		21	14[3]	4	1	1	
Pneumoconioses (inc. Silicosis)	12	104	681		2	20	13	
Poisoning — origin:								
Aniline				12				
Arsenic			10	1				
Benzene (and homologues)	110	4	45 26	2				
Carbon bisulphide		2	5		1			
Carbon monoxide		1	35		10	1		
Chromates		3		73	2	5		
Lead	73	43	37 704	116 168	54[3] 9	57 15	64	2
Manganese[4]			2					
Mercury	2	2	8 13	9 1		1	16	2
Nitrous fumes					2			
Sulphuretted hydrogen			9					
Various substances				13[3]				

	Belgium[2]	France[1]	Great Britain[1]	Nether-lands[1]	Sweden[1]	Yugo-slavia[2]

1. Cases notified.
2. Cases compensated.
3. Nine of the anthrax cases, and the poisoning cases were in agriculture.
4. Denmark reported one case of manganese poisoning.

Table 1. Poisonings

Medical Inspection

THE development of measures for the protection of workers must of necessity be accompanied by effective organization of application

and control. Hence the movement in favor of medical inspection in industry, in regard to which the Washington conference adopted a recommendation with a view to safeguarding employee health.

	Czechoslovakia[2]	Germany	Great Britain	Netherlands[1]
Bone, muscle and joint diseases[3]	1	69		
Cancer: epitheliomatous			143	
: of the lungs	13	1		
Cataract	29	16		
Deafness (due to noise)	4	11		
Dermatosis				63
Eye diseases	13			13
Eczema	3			
Nystagmus	13			42
Respiratory diseases		11		
Tropical diseases		5		
Infectious diseases		216		
Skin diseases		35		
Purulent bursitis of knee				42

1. Cases notified. 2. Cases compensated.
3. Due to work with compressed air tools.

NOTE: In France there were two cases, and in Germany one case, of "X-ray disease."

Table 2. Occupational Diseases

The whole problem of medical inspection was examined afresh by the correspondence committee on industrial hygiene, which unanimously approved the following guiding principles:

1. It is essential that each country should possess a medical inspectorate charged with the duty of protecting the health of the workers, and with the prevention of accidents, in so far as the human factor is concerned in accident causation.

2. The officials of that inspectorate should devote their activities entirely to the task with which they are entrusted by the government authorities.

3. The industrial medical inspectorate is an essential part of the supervision of working conditions, but it should be separate from the technical inspectorate while working in close collaboration with it. It is desirable to maintain contact between the officials of the industrial medical inspectorate and of the public health service.

4. The members of the industrial medical inspectorate should have the same rights of entry as the members of the technical inspectorate.

5. It is necessary that medical university instruction should provide for all students a general training in industrial medicine, and that technical instruction in technical schools and universities should provide a general training in industrial hygiene and safety; moreover that provision should be made, in such a manner as may be considered most applicable to national conditions, for advanced instruction for such medical men as may desire to qualify themselves for specializing in the field of industrial medicine and hygiene.

The publication which the I. L. O. hopes to issue in 1935 on research methods in factories originated in a desire to give effect to these same principles.

In Australia the report of the New South Wales Division of Industrial Hygiene for 1931 and 1932 contains the results of inquiries into the danger due to dust and spray painting, the incidence of arsenic poisoning and of baker's dermatitis.

In Canada an amendment of May 1, 1934, to the Saskatchewan public health act set up a Health Service Board, which will have power, among other things, to confer with and advise employers and employees in cities with regard to the institution of health services.

In Denmark the Medical Inspector of Factories in the course of 1933-1934 pursued research into silicosis, lead poisoning, eczema and risk from exposure to cobalt, manganese, etc.

In Great Britain the report of the senior medical inspector of factories draws attention, among other matters, to the risk presented by dioxan, poisoning by which has recently been added to the schedule of compensable diseases.

In the Netherlands the annual report of the inspectorate—medical service—contains an account of occupational diseases notified, and of various health inquiries, especially in dusty trades where the workers are frequently examined by x-ray.

In Spain the decree of April 19, 1934, creates a single advisory body to deal with health questions and public relief; one section will be devoted to tuberculosis, malaria, industrial hygiene, etc.

In the United States the Pennsylvania Department of Labor and Industry is conducting an inquiry into the incidence of occupational diseases, including: physical examination of 2.800 anthracite miners in cooperation with the United States Public Health Service to obtain data relative to the incidence of asthma among miners; sampling and chemical analysis of air in industrial plants in order to detect the presence of poisonous dust, gas and fumes; and finally, visits of registered nurses to workers' homes to determine whether absence from work is due to employment.

Education and Publicity

IN THE Argentine a Council of Social Medicine has been instituted at the Faculty of Medicine at Buenos Aires.

In Canada the National Health Council is directing its attention to industrial hygiene.

In Czechoslovakia the section for the study of industrial hygiene, organized within the Association of Czechoslovak Physicians, comprises not only the Prague Faculty of Medicine but also leading physicians of provincial hospitals and the medical departments of the most important industrial corporations. The social hygiene section of the Institute of Public Hygiene has also dealt with questions connected with industrial physiology.

In Germany instruction in occupational diseases has received official recognition at Berlin University in that the clinic for occupational diseases, which held its tenth anniversary in 1934, has been raised to the status of Institute.

In Great Britain the University of Birmingham has instituted a Department of Industrial Hygiene and Medicine.

In Japan the Institute for the Science of Labour at Kurasiki is conducting research into environmental conditions and physiopathology, and in addition began during 1934 to deal with health and hygiene conditions in relation to agriculture.

In Mexico the president promised the creation of a section of industrial hygiene under the Scientific Labor Institute.

In Spain an association for industrial medicine has been founded, with its office at Madrid near the industrial clinic of the National Insurance Institute.

In the U.S.S.R. an order reorganizes the system of institutions for scientific research; questions of industrial hygiene, physiology, pathology and industrial medicine are assigned exclusively to the scientific institutions under the jurisdiction of the Commissariats of Public Health of the different republics.

The Pneumonokonio-Series

NOT the name of a new disease—simply an alliterative contraction of the "Pneumonokonioses Series" which Dr. Geo. G. Davis' compilations of data on "dusted lung" afflictions have become.

For there are now *two* books. The new book, No. II, is just off the press. Its title is:

REVIEW of the Pneumonokonioses (Silicosis) —Literature and Laws of 1934. By GEO. G. DAVIS, M.D., F.A.C.S., Associate Professor of Surgery, Rush Medical College; Attending Surgeon, Cook County Hospital, Chicago; ELLA M. SALMONSEN, Medical Reference Librarian, The John Crerar Library, Chicago; and JOSEPH L. EARLYWINE, Attorney at Law, Chicago.

In size, typographical style, binding, number of pages and mechanical details the new book is a companion—indeed, almost a twin—of its predecessor volume.

Before describing the arrangement of the contents, it is necessary to state what the contents are. As in the first book, the subject matter is in two parts; Part I of the initial volume was exclusively bibliography, but Part I of the new book is bibliography *plus text.*

Following the key number is the author's name —or the source, if the item is unsigned. Then comes the title of the article, followed by the reference to the publication.

These details, which—in the logic of the development of Dr. Davis' plan—were necessarily the bare substance of Book I, are, however, only the points of beginning as to Book II. For, in the new book, they are followed, in each case, by the abstract, extract or review which, in the exercise of judgment and discrimination, is best calculated to give the reader the gist, the point, the part of the article or item that proves its right to be written and to be read. This may be illustrated by a citation, at random (from p. 278):

276. Policard, A.

Pathogeny of Pulmonary Silicosis.
Presse méd. 42:359, March 3, 1934.

The author in view of his previous publications, emphasizes the pathogeny of silicosis as still full of obscurity. That silica is the only cause of nodular fibrosis would seem denied by the fact that many subjects have lived out long lives in the midst of very thick dust from rocks without developing any pulmonary fibrosis, while their companions were struck down. Another factor to be looked for—tuberculosis —very often comes in but perhaps not as obligatory.

Histologically all intermediate stages exist between the nodule called silicotic, the very fibrous one, and the cheesy tuberculosis nodules. These fibroses differ little.

Experimentally it seems that pulmonary fibrosis does not occur without an intervening infection. Although officially admitted that free silica is actually the cause of silicotic fibrosis of the lung, it cannot be considered chemically demonstrated. The recent works of Jones bring in serious arguments for sericite as a causal factor . . .

In this fashion the year 1934—in articles, papers, news items, opinions, scientific advance, medical developments, experimental and research work, medicolegal and compensation matters, official investigations, case reports, and preventive measures developed and applied—is completely covered with respect to the pneumonokonioses and their allied subjects and control.

And thus the new book is so much more than a textbook. It has the substance of all that was written by the authors of the year; important and authoritative articles, from the pens of those who know most about the subject and are doing the most important work in connection with it, are abundant; current events in the general situation are given their proper recognition; the familiar names recur, with contributions of new and added value.

WHERE the mere event is concerned, a digest of the initial account may be, in fact is usually designed to be, a mirror in which one may see only the important and essential—the unimportant and unessential having been sifted out or absorbed through the process of reflection.

But where the subject matter to be condensed has a scientific, or experimental, or intellectual significance, the extract, abstract or review must possess very different properties from those which yield only a reflection. Instead of being a mirror to be *looked at,* before another image replaces the one now there, each such condensation must be a lens to be *looked through,* as the means to a closer, better detailed and more clearly delineated picture.

This distinction has been carefully observed by the editors, and the new book is thus a remarkable panorama of the medical, medicolegal, factual and controversial developments of the year in connection with the pneumonokonioses.

The size of the undertaking, and the amount of work involved in the presentation which is Part I of this new book, may be understood from the statement that there are about 400 pages in this section, with 396 condensations averaging nearly 300 words each, all in meticulous English (translation of the foreign language sources alone was a tremendous undertaking), and all written with the utmost competency of technical understanding as to the author's point of view and treatment of his subject.

The first and second references are:

1. A. G. N.

Recent Studies on Silicosis.
Canad. M. J. 31:304-306, Sept., 1934.

2. Abraham, A.

Silicosis in Quartz-Melting Workers and in Workers at Polishing Materials.
Zentralbl. f. Gewerbehyg. 21: 151-152, Sept.-Dec., 1934.

And the last reference is:

396. Zimmerman.

Illegal Silicosis Claims Drain Millions from Industry.
Mfg. News, 46: 25-26, Aug., 1934.

THERE is no pre-determination in the fact that the first and second references seem to jump right into silicosis, while the last one treats of the same thing. It is only an alphabetical coincidence; silicosis just happened to open the author's

sequence at "A" and to close it at "Z." This fortuity, however, suggests that, in between, the pneumonokonioses—all of them that were written about in 1934, by everyone from "Abraham" to "Zimmerman"—are covered, literally, from "A" to "Z". And that is, indeed, the case: "Alfalfa" leads off the subjects treated in connection with dusty lungs, and the list ends with "Zinc."

This second book has rather ingenious indexes of authors and subjects, and there is also an extension of the purely reference section of the first book. Part II, as before, is the law section, with a digest of statutes, and of cases, pertaining to the law on occupational diseases in the United States, supplementary to and bringing down to date the law section of Book I, which was complete to the end of 1933. Part II, with the indexes and supplemental references, brings the page total to 490.

SOME of the sources of the 1934 literature of the pneumonokonioses have a controversial trend, mostly centering around silicosis, which, of course, is the most important of the dusty lung diseases. The principal matters of controversy, or differences of opinion perhaps, or divergences of theory, may be made quite clearly apparent by emphasis on certain words in a paragraph in Dr. Carey P. McCord's book, "Industrial Hygiene for Engineers and Managers," published in 1931:

"The *many forms* of silicates, when taken into the body through the respiratory tract, slowly lead to a dusty lung disease known as 'silicosis.' *Special forms* of this disease, such as 'asbestosis' are recognized. Silicosis is *probably* the result of chemical action of the siliceous materials, but undoubtedly mechanical action plays some part. Cases may be produced within less than *one year of exposure*, but the usual case requires several years to develop. Findings are essentially characteristic. Patients complain of difficulty in breathing, of pain in the chest and of impaired heart function. No treatment is efficacious. While established cases of silicosis are totally disabling, *tuberculosis* is a common concomitant. This disease is encountered among workers in granite and sandstone quarrying, stone dressing, in mining and in city excavation work, *etc.*"

The italics (ours) emphasize a few of the obvious reasons for experiments, reports, studies and articles, namely: the different forms of silicates; the special forms of silicosis; the chemical action, and the mechanical action, of the inhaled particles; the time element as to exposure; the association with tuberculosis; and the "etc." as indicative of the many places and the many kinds of work in which silicosis may be found. And the whole paragraph, written before the avalanche of lawsuits for alleged silicosis descended upon industry, seems now, in the light of what has happened, to have been very eloquent of what might happen.

An incurable disease, with characteristic and rather simple symptoms, disabling, of slow and insidious development, encountered among workers in materials containing a substance so common that it is "three-fifths of the rind of the world," and so accustomed that mankind has breathed it without much thought of consequences ever since God created Adam out of the dust of which it was a part! Given this, and a generation of workers grown compensation conscious, add an industrial depression, turn loose a group of contingent-fee lawyers, and you have the "silicosis situation" of the last few years—a situation so serious to industry that, as one writer put it: "the doctors turned to study and the presidents turned to prayer."

THE doctors turned to study," and, of course, they began with the literature. And what they found was what Dr. Davis undertook to correct. The literature was extensive but unorganized. There was plenty to read, but no means of orientation as to what should be read. As to many important references the initial process of identification was impracticable where it was not impossible; and as to all the references, the body of the literature was big but had no dimensions. Book I of Dr. Davis' series straightened this out. What there is to read, who wrote it, when it was written, and where it can be found are all answered in his first book; the literature of the pneumonokonioses is organized, measured, dated, indexed — given chronology and order — so that since publication of the book, and for the first time in medical history, a doctor can read up on the pneumonokonioses and feel sure when he is done that nothing has been left unread.

With all of the world to cover and all of time between 1556 and 1934 to examine, and with 2768 references to organize, there would not be room in the first book for such abstracts, extracts and reviews as comprise the second. A single year can be so handled; a century or two cannot. And then, too, since it was obviously impossible to condense all of the articles, the business of condensing any of them would have involved a selection. And no selection could be made without a comparative evaluation, which would require the exercise of the faculty of criticism. This, however, had no place in Dr. Davis' plans. His idea—from long and intensive industrial experience and appreciation of industrial problems—was to make *all the literature* available: in his first book, for all previous years, by references; and in his second book, for the single previous year, by references *plus abstracts, extracts and reviews.*

And his idea is to cover, from now on—one year at a time—each successive year as it goes by, so long as the pneumonokonioses are a matter of sufficient industrial interest.

Dr. Davis' was and is a practical plan, and thus far he has carried it out in a highly practical and highly commendable manner.

His first book is established as the indispensable guide to the pneumonokonioses literature of the past. His second book is all of that as to the literature of 1934, and in addition is much more—as much more as would be expected of a voluminous textbook. Over and above its inestimable value to the student, research worker, physician, executive, state official, safety engineer, health officer, librarian, journalist, and many others who have a special interest in dust diseases, it is a fascinating and absorbing book—interesting in, of, and by, itself. The dust storms of the middle west are phenomena of 1935, but physicians and others interested in the pathology of the problems they brought, will find plenty to hold their attention. Even the reader whose interest is casual, once he begins it, will discover himself reluctant to put it down. And that, it seems, is quite something to be said of an abstract of such a technical medical subject as the pneumonokonioses.

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Alice Hamilton, M. D.

SHE invariably signs herself "Alice Hamilton, M.D." Books, articles, papers, reports, letters all have just that as the source of their authorship. For her "it is enough . . . " Not repression on her part; merely simplicity. Titles have come to her, honors have sought her, but they are only incidental. Thirty-five years ago, after a year's internship, she did not want to practice medicine because of the responsibilities for human life involved. Today she has a record of having assumed and discharged more responsibilities for human life than there is any way of reckoning. She will never know how many lives she has saved, but it is, in her own attitude toward her career, as if she had fought for each one by a bedside in the night. For she gave *herself* to her special practice with the same high ideal of service that characterizes the doctors who attain to greatness in any field of medicine or surgery—and who know they are great when they can pass the test of realization that they are only stewards of their talents. "Alice Hamilton, M.D." says it all. Between herself and her profession—on a parity as to the idealism which it demanded of her and which she so well translated into service—equal to equal—it is, both ways, a twenty-one gun salute.

Quality and Qualifications

THERE is appearing a brisk trickle of demand for time-study men, a demand likely to swell to a considerable volume as rate structures, neglected during the depression, undergo the inevitable overhauling from top to bottom. *The rate offered by one firm for such men is 47 cents per hour.*

"This task of rate revision must be carried on during a period in which there is every possibility of labor unrest. *It is no job for an amateur.*

"Motion-study technique, developed by Taylor, the Gilbreths and Mogensen, may properly be ranked among the major inventions of the age. But, like labor-saving inventions generally, its immediate effect is to abolish jobs. Except in moments of national hysteria we all realize that the elimination of waste, whether by machinery or by motion-study, must go on. But it should be done at the least cost in human displacement; if industry does not find ways to minimize the shock, society will. Again, *it is no job for an inexperienced youth.*"*

The foregoing statements have such a specific application to the present situation in industry regarding physical examinations, x-ray films of the chest, and investigations regarding health hazards in industry, that the analogy is striking.

In the first instance, the rates for physical examinations, whether periodic, pre-employment, or for purposes of underwriting insurance, are apt to be the target of employers, representatives of insurance companies, and brokers and agents. The industrial physician, however, should always understand that when he does work on a so-called "wholesale" basis, examining many employees or possibly making many special types of laboratory or clinical tests, it might well be expected by the insurance groups that he give a special rate for this service, the rate being consistent with the volume of the work done. However, insurance representatives and others who arrange for this service must also understand that there is a price limit for professional work below which the physician cannot consistently go and at the same time render assistance which is of value—in other words, there is a point at which quality and price do not proceed in parallel but become disproportionate. Furthermore, the majority of physicians who possess the real qualifications for properly doing the kind of work mentioned will not be found among those whose prices have been lowered to the so-called "bargain counter" level.

As Dutton says, "this task of rate revision must be carried on during a period in which there is every possibility of labor unrest. *It is no job for an amateur.*" The analogy here again is applicable: the task of physical examinations of industrial employees and also the investigation of possible health hazards in industry must also be carried on during a period in which there is every possibility of labor unrest—but it must be done and furthermore, as Dutton says, this too, *is no job for an amateur.* Representative medical directors of large corporations have already found that the so-called "old-fashioned" physical examination in industry is not efficient in protecting the employees and the company against possible health hazards and subsequent occupational disease. Few there be who understand the relationship of exposure to specific types of health hazards in the distinct etiological relationships regarding the contracting of occupational disease; fewer there are whose practical knowledge and procedures extend to the point where it is possible to review the physical findings of any given individual in terms of the hazard into which he is going or has been; and fewest there are who can adequately establish a cause and effect relationship between the data from investigations of in-

* DUTTON, H. P.: "Courting Labor Trouble?", *Factory Management & Maintenance*, 93: 287, July, 1935.

dustrial environmental exposure, the rating of the occupational disease hazards, and the possible effects of such hazards in the past production of occupational disease or as viewed in the light of future potentialities—summing up finally the medicolegal and compensation relationships of any given situation where such data are obtainable. This line of reasoning, however, has come to be the real basis for proper understanding of compensation and insurance problems relating to occupational disease.

Not for one moment would we assume that every physician and surgeon in practice is capable of doing the highly specialized work necessary in the investigation of industrial environment, the proper adaptation of specific examinations to such an environment, and the proper usage of such material in medicolegal and compensation relationships.

Industrial medicine, industrial hygiene and the field of occupational diseases have become a highly specialized type of medical work, not only medical, but also associated with a knowledge of engineering, toxicology, and laboratory procedures which are concerned with physical and chemical determinations. Of particular importance is it to the investigator to know the type of manufacturing, the processes, the materials, and other pertinent points, and also to know toxicologically what effects these things may have on the human body during the industrial exposure. An increasing number of physicians in industry and specialists are making diligent efforts along these lines, although if industry and the insurance companies suddenly awoke to the necessities of the situation, the demand would far exceed the supply.

Again, Dutton strikes hot metal when he states: "Except in moments of national hysteria we all realize that the elimination of waste, whether by machinery or by motion-study, must go on. But it should be done at the least cost in human displacement; if industry does not find ways to minimize the shock, society will. Again, *it is no job for an inexperienced youth.*" Here we find also that industry must eliminate waste—human waste—by means of the medical and engineering tools which can be used by trained professionals. This too should be done at the least cost in human displacement—one certainly would not keep a man within the bounds of industry on a hazardous job when he has already shown signs of disease—when he might become a menace to himself, to his fellow workmen, or to his employer. In the occupational disease situation, fortunately enough, there are many instances where, if the man can be removed from the hazardous exposure, he could be kept on other gainful work, thus not becoming a burden to himself or to society. Only by intensive and long experience, and in the acquisition of discrimination and judgment, does the physician have the faculty of deciding whether further exposure, or removal from exposure, or complete disability is the answer. The same principle applies in the investigation of occupational disease hazards in the industrial environment and in the results of the physical examinations either before employment or periodically. This is a problem where the technics of the situation must be well-known and well applied—but the socio-economic implications of each individual's situation may assume as much importance as the technical data.

From Dutton's analogy it would appear that in this problem as well as in that of motion-study and rate structures, if industry does not find ways to minimize the shock incident to cleaning up the health hazards, and the selecting of personnel which will be as free from potential human waste as our present methods can make it, society will inevitably take its own course.

We believe, therefore, as has been many times emphasized in the past through these columns, that high quality and high qualifications in industrial medicine, industrial hygiene, and occupational disease work will eventually result in real economy. Some employers, some insurance companies, and some others have realized the truth of this statement and have achieved good results. It is a matter of time and experience for others to learn that the best professional services available, like the best methods of production and marketing, are none too good for the industry which considers itself progressive.

Hell-Bent Compensationward

INTERNATIONAL Labour Office, Geneva, in Chapter II of its "I. L. O. Year-Book, 1934-35," casts up the progress of industrial medicine in 1934. That was a year of considerable interest in this field in the United States, as we know from our domestic activities, and it appears to have been the same kind of year throughout the rest of the world, as we discover from the report. But though it was a year of work, and of growth, its results in terms of outstanding events make it, internationally, only a mildly colorful strand in the fabric of industrial medical history.

The I. L. O. report, of course, could not go into much detail, and thus a matter or two in which there was undoubtedly a real story, is but briefly mentioned—for example, the "wealth of studies and inquiries in various countries concerning pulmonary injuries due to dust."

With reference to things done, the impression from the report is that the whole world seems to be "going compensation," and that, as a record of progress in industrial medicine, there is too little of the medicine. But industrial medical practice is not, any more than medicine in general, a succession of spectacular events; there is plenty in the report to indicate that the vast amount of medical study and research noted as being under way is doing the slow, methodical, unspectacular leavening characteristic of medical science.

The international developments of 1934 in industrial medicine may be put in three main divisions: *first*, the carrying forward of policies and measures already under way; *second*, the evolving of new policies and measures; and *third*, the progress in research.

AS TO the first, the carrying forward appears to have been principally the extension of workmen's compensation to include occupational diseases. There is much of this; its mention is so disproportionate to the record of preventive measures as to require a lot of faith in the implication that the latter are being given the proper medical attention. There was some consideration of physical examinations: "in Germany various authorities have demanded that a factory doctor be attached to all establishments with a view to assur-

ing daily medical care . . . In Hungary the National Social Insurance Institution opened a dispensary for periodical medical examinations of workers exposed to the risk of lead poisoning . . ." But so far as this report goes, the pre-employment examination did not get much attention; its use is implied rather than mentioned. I. L. O. comments: "It is not sufficient to organize a simple scheme of medical care for diseases designated 'craftsmen's diseases,' unless at the same time adequate prophylactic measures are applied." The "simple scheme" seems to be to put them under compensation. A good many of these diseases are comparatively new, but compensation is old enough in most countries to have become familiar; and diseases everywhere seem so much less formidable when they can be thought of in accustomed terms. Put them under compensation—"isn't that what compensation is for?"—and do no more about them until the costs become almost prohibitive. That has been the "simple scheme" in most of our states, and in spite of the overwhelming evidence that putting them under compensation is, at best, only one of two steps which should be taken together, the first step is being taken in very many instances, the second in only a few. This "simple scheme" as it is being used both here and abroad reminds of the old story of the Indian who applied a red-hot iron to a chancre, giving as his reason that he *did* know how to cure a burn.

But maybe we should not presume to criticize what is being done elsewhere; less than half a dozen of our states are handling their occupational disease problems sensibly, which means *medically*, and prophylaxis — prevention, arresting at source—begins at home.

AMONG the newer policies to which world-wide interest gave special impetus, in 1934, the following may be noted:

1. The recognition of the necessity for the intervention of medical men in "vocational guidance," which is less technically identified, perhaps, as the proper placement of employees—not only as a matter of the initial choice of a career by those just beginning, but also and more important, the subsequent readaptation of the disabled, the defective, and the previously-compensated to whatever occupational environment will enable them to continue working with the best chance of satisfaction and *safety*.

2. The emphasis on the close relationship between industrial health and public health, and the implication of dire need for more general cooperation on the part of all the agencies of both.

3. The importance of medical service for the smaller industries, and the need for a statistical background in this respect, as well as in respect of the economic answer to the problem of absenteeism from sickness. The estimate that "British industry loses 29 million working weeks annually through absence of workers" means, at average wage, a half-billion-dollar yearly loss to an aggregate somebody.

4. The acceptance of industrial medicine as a field of medical practice as definite in its entity as the field of any specialist. Thus: "instruction in occupational diseases has received official recognition at Berlin University . . . In Great Britain the University of Birmingham has instituted a Department of Industrial Hygiene and Medicine . . . In Mexico the president promised the creation of a section of industrial hygiene under the Scientific Labor Institute . . . In Spain an association for industrial medicine has been founded . . ." And the unanimous approval given by the I. L. O. Correspondence Committee on Industrial Hygiene to the guiding principle: "It is necessary that medical university instruction should provide for all students a general training in industrial medicine, and that technical instruction in technical schools and universities should provide a general training in industrial hygiene and safety . . ."

The report says: "Industrial hygiene should, it is held, occupy a much more important place than it has done." But it doesn't add—possibly in view of the Correspondence Committee's approval of the latter of the guiding principles just quoted—that only an M.D. can become the kind of industrial hygienist who will properly fill that "more important place."

PROGRESS in research is exemplified in the success of the efforts of Dr. Twort, Director of the Cancer Research Laboratory of the Manchester Cancer Committee, to find means of "preventing cancer due to mineral oil used by mule spinners in the cotton industry." His work was facilitated by the results obtained through the research of others, according to whom certain cyclic carbides and their derivatives possess carcinogenic action on the animal organism. Great Britain reported 143 cases of epitheliomatous cancer.

Extension of preventive measures is the reason for the special interest which attaches to what happened in several countries—for example:

In Turkey, where "a labor code in preparation will contain measures of protection for workers, including a permanent medical service for all factories employing upwards of 100 workers, while those employing under that number will be required to make arrangements with a doctor in private practice."

In Costa Rica, where new regulations classify as accidents for purposes of compensation "occupational diseases contracted as an immediate, direct and indubitable result of employment."

In Queensland, Australia, where Weil's disease was added to the list of diseases covered by workmen's compensation.

In the Irish Free State, where a schedule of compensable diseases names a lengthy list.

In the Union of South Africa, where 1,100 "silicotic beneficiaries," in the ante-primary and primary stage, were put back at work "in suitable occupations."

THE occupational disease statistics, gathered for the first time, even though incomplete, are a good beginning along an important line. The I. L. O. will be influential in the matter of such a standardization of reporting methods and forms as will sometime make statistics of this kind available and useful. The new complexities of the subject evident in the 1934 developments alone emphasize the need for a beginning toward comparative uniformity. This need is a long standing one in the United States, where "the completed reports in some states do not even separate accidents from sicknesses." The evolutions of the I. L. O. in this respect *may* even penetrate to our state authorities, so that the deplorable unintelli-

gence of the reporting methods commented on by Dr. Lanza elsewhere in these pages will eventually yield to a semblance of order. It is possible.

In the preface to her "Industrial Toxicology," Dr. Alice Hamilton says: "there are two ancient poisons, carbon monoxide and lead, which, although very familiar, can never be given cursory treatment because each year brings some new additions to our knowledge concerning them." The I. L. O. report cites one instance, in Queensland, which hasn't been talked about much: "the widespread use of paints with a lead content for fences and verandas. Under the action of the sun the paint peels off, and the toxic dust is set free and carried to the mouth by the hands of children touching the painted surfaces."

The statistical tabulation is interesting as to both lead and carbon monoxide poisoning; it shows also three recognitions of the rarely encountered poisoning from manganese.

IN GENERAL the year 1934 seems to have witnessed a lot of legislation intended to improve working conditions — as many new laws, orders and regulations as any previous year, and, in respect of occupational diseases, probably exceeding all previous numbers. The silicosis situation accounts for the largest portion of these directed at any specific condition. The year closed with that situation beginning, from the preventive angle at least, to reflect the essential common sense which industry as a whole possesses but seems so reluctant to use until after indifference to a situation where it should be used has proved very costly.

On the scientific side, the I. L. O. review implies that among the medical men across the Atlantic there are many who set store by Dr. W. R. Jones' sericite theory.

Discoveries of unsuspected toxic properties in substances of common use, particularly with relation to skin diseases, had their share of attention during the year. Several items of this kind, taken together with New York's recognition of "any and all occupational diseases" as compensable, lead even the casually thoughtful along an obvious line: Does not the risk, investigated in France, of "poisoning from soldering galvanized sheet iron" suggest certain new uses of a soldering iron? And do not the measures of protection urged, also in France, "as regards the maintenance of telegraph poles impregnated with creosote in large quantities" promise a new trouble for the already greatly troubled railroads—"section-man's disease," from tamping creosoted ties? To those who are familiar with the increasing vagaries of the legal mind in compensation interpretations, such things are far from ridiculous.

THE United States is credited with Maryland's physical examinations of sub-standard workers in certain industries, for ascertaining the extent to which physical handicaps or infirmities constitute a disability for certain industrial operations; with the Occupational Hygiene Division set up within the Department of Labor and Industry of Massachusetts; with Kentucky's silicosis amendment, the Massachusett's Commission's report in February, 1934, on the incidence of certain occupational diseases, New York's extension of compensation to dermatitis from the use of brick, cement, lime, concrete or mortar, etc., Pennsylvania's committee report recommending special compensation legislation, and Wisconsin's definition of the term "accident."

There is also the inquiry into the incidence of occupational diseases initiated by the Pennsylvania Department of Labor and Industry, the increased attention given to problems of industrial pathology at the Cleveland convention of the American Medical Association, statistics on the human factor in accidents presented at the National Safety Congress, and the investigation of silicosis among 125 granite cutters by the Industrial Hygiene Division of the New York State Labor Department.

IN ADDITION to its many features which are interesting in themselves, the I. L. O. Year-Book chapter as a whole does something for industrial medicine that nothing else could do. Anything traveling as fast as industrial medicine now is—particularly if its so speedy progress is in a new direction—needs to know once in a while whether or not it is sticking to its course. Is it still headed toward the sanity of medical control, or has it veered off, especially in its occupational disease phases, toward the lay bedlam in whose green pastures the compensation award grows fat and multiplies its kind? The I. L. O., from its international vantage point, "shoots the sun," and out of its findings we may draw our own conclusions as to whither we are bound.

Editorials in a Preamble

THE preamble to the constitution of the Association for the Advancement of Industrial Medicine and Surgery, organized a few months ago in New York City,* reads as follows:

"Believing that there is a large group of physicians and surgeons actively engaged in the treatment and management of industrial conditions, and that this group encounter routinely a variety of problems quite foreign to those not engaged in this field of endeavor, we propose to bind ourselves together into a professional and scientific society in order to render more efficient service to our patients, to industry, and in fact to the entire community in which we practice."

There are several editorial paragraphs in these words.

One is in: "physicians and surgeons actively engaged in the treatment and management of industrial conditions."

Another is in: "encounter routinely a variety of problems quite foreign to those not actively engaged in this field of endeavor."

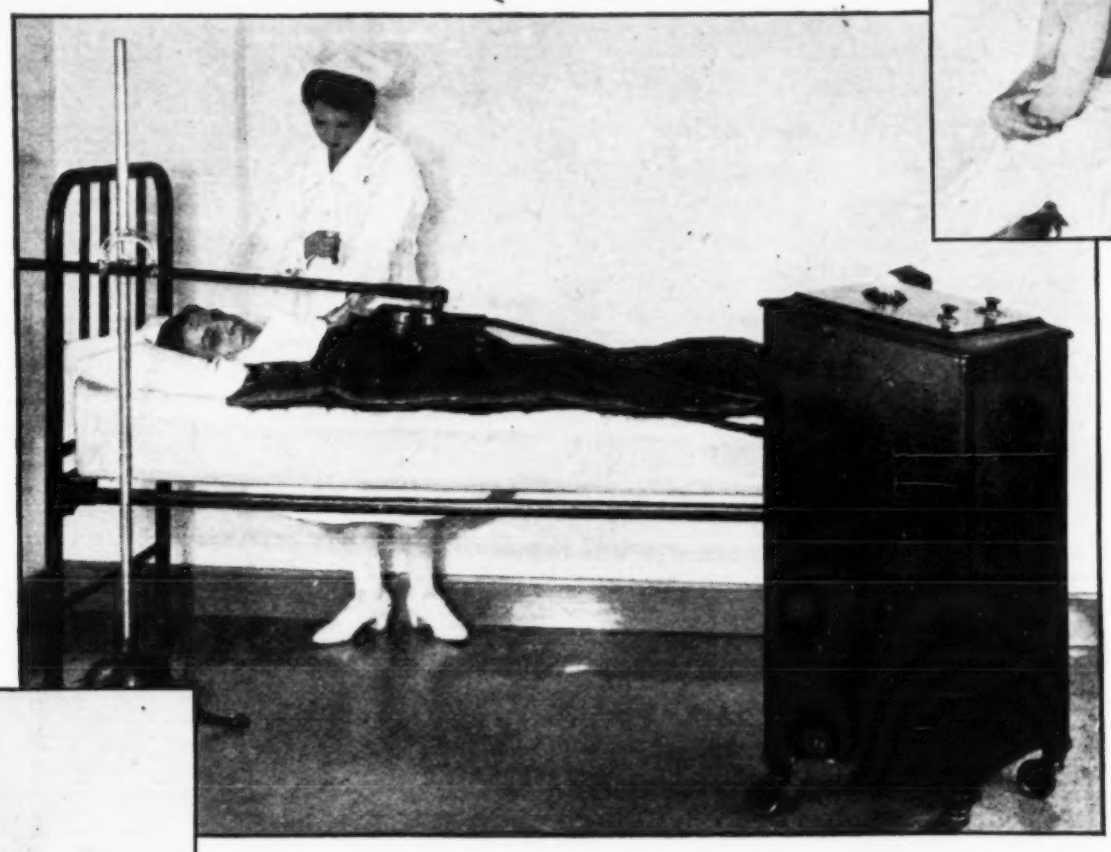
One more is in the preamble as a whole.

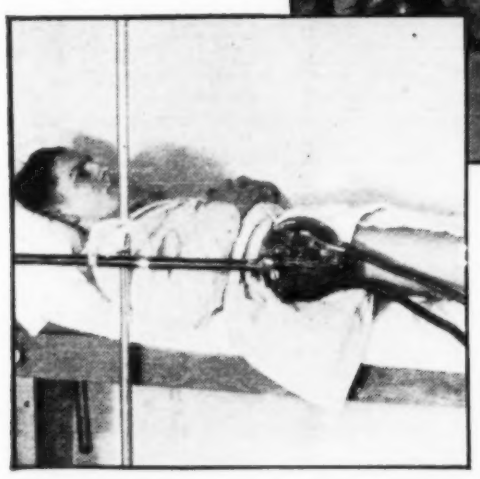
If you care for the mental exercise, underscore the words "treatment and management", and think about them for a while. Then emphasize "industrial conditions", and think about them some more. Do the same with "encounter routinely", and extend the thought to include "problems foreign". And then, if you are not worn out, ask yourself: Why a preamble? Why a constitution? Why an association?

You will think of answers. But if they don't satisfy you, and you are still interested, write to us; like P. Hal Sims with his bridge correspondents, we have our own answer ready.

* *Industrial Medicine*, May, 1935, p. 235.

INDUCTOTHERM





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Industrial Medicine and Surgery

Traumatic Cancer

MANY recent fundamental contributions on the causation of tumors have an important bearing on the relation of trauma to cancer.* When nothing definite was known about the effective exciting factors in mammary cancer it was permissible to adopt the traumatic theory in cases in which the clinical evidence pointed strongly that way. Now that it is known that one can produce mammary cancers in mice almost at will by overstimulation with theelin, whereas no one has succeeded in producing this disease by trauma, the traumatic origin becomes much less acceptable. Cancer has now been produced experimentally by many agents, but always under specific conditions that are not related to trauma, and the experimental data reveal the fact that the genesis of cancer requires quite peculiar factors which have not been found in the results of simple trauma.

The newer revelations regarding the physiologic significance of tumors cannot fail to modify views concerning their possible relation to simple traumas. At one time it seemed necessary to assume that many cases of giant cell tumor of bone resulted from injury, but since it has appeared that this disease is related to a functional disturbance of the parathyroid gland and that giant cell tumors may be produced by hyperparathyroidism and cured by extirpation of tumors of the parathyroid glands, it becomes unnecessary to introduce the idea of trauma into the etiology of giant cell tumors. The application of di-benzanthracene to experimental animals produces cancer and sarcoma promptly and almost invariably, whereas the innumerable efforts to cause tumor by simple trauma have always failed. This contrast cannot fail to impress thoughtful observers with the fact that when one deals with real cancerigenic agents the results are definite, positive and even startling, and that the negative results of traumatization indicate that a trauma does not possess the essential elements of a cancerigenic agent.

These and many other contributions of the past two decades have greatly widened the breach between the real causation of malignant tumors and the theory that they may be caused by single trauma and these new facts must be fully considered in forming opinions regarding the traumatic origin of any given tumor. However, the new facts do not warrant the exclusion of trauma as a possible cause of many tumors. The clinical evidence is too substantial in many cases to be dismissed on theoretical grounds. Recent knowledge demands merely that the evidence favoring trauma must be scrutinized more closely and great importance must be given to other factors which are more in line with the causes known to be effective in exciting neoplastic growth.

While it is now generally agreed that a single trauma never produces a malignant tumor in previously normal tissue, this principle may not greatly reduce the medicolegal importance of an injury as an indirect cause of a tumor. When a lacerated wound of the skin with implantation of foreign material fails to heal, becomes infected and suppurates for weeks or months, and cancer finally appears in the edges, it is clear that the cancer would not have occurred without the trauma.

One of the chief difficulties in the estimation of the frequency of traumatic cancer is the uncertainty of the statements of interested patients.

All statements of claimants and eye-witnesses regarding accidents should be supported by concrete, readily verifiable evidence relating to the locality of the accident, the objects alleged to have been concerned and the possibility of the occurrence of the injury described. If such necessary evidence were secured, the number of reports of traumatic cancer in the literature would be enormously reduced.

Assuming that every tumor that arises after trauma is of traumatic origin, one still finds the incidence of traumatic tumors extremely low. Lewy found that 37 malignant tumors had occurred among 26,389 injured persons. In few of these cases could the claim of a traumatic origin be established as reasonable. This incidence is about the normal incidence of tumors among the general population.

Not only those persons who acquire supposedly traumatic tumors, but all classes of the population, especially young persons and artisans, are constantly exposed to injuries, mild and substantial, to which they pay no attention.

The skin, the bones and the female breasts are especially exposed to injuries. There is thus established a strong probability that by mere coincidence any portion of the body in which a tumor develops has at a recent date received a blow.

The probability of coincidence becomes more clearly revealed when one considers the factor of time in the development of cancer. Cancer does not develop suddenly. The precancerous changes cover a period of months and sometimes years before the signs of established disease appear. During all this time the tissues are exposed to the usual traumas, mild and severe, to which the average person in active life is subjected. If at any time during this long period a trauma occurs at the site of the precancerous lesion, the subsequent cancer may erroneously be attributed to the trauma, whereas it is the inevitable result of the progress of precancerous changes which had nothing to do with the trauma.

The interpretation of compensation laws should recognize that a trauma is never the sole cause of a cancer and is often only a subordinate, although determining, cause, that the probability of coincidence is great, that aggravation by injury is rare and difficult to establish, and that many difficulties and uncertainties will surround this subject for a long time to come. Some form of recognition of partial liability seems necessary to meet these conditions. Without it the compensation law becomes a form of sickness insurance against the natural occurrence and ordinary consequences of one of the major causes of disability and the cause of 10% of the deaths.

* JAMES EWING, M.D.; abs. in *Current Medicine* from *Arch. Path.*, May, 1935.

Traumatic Surgery

DR. JOHN J. MOORHEAD outlines 16 points to be remembered when caring for traumatic surgery injuries:*

1. Every wound not made with surgical intent is already infected and should be so regarded and treated.
2. In the first six hours accidental wounds are practically germ-free and hence treatment within these golden hours is likely to be successful.
3. The essence of wound treatment is an attempt (a) to remove foreign material such as dirt, and (b) to remove serum, blood and devitalized tissue as represented by bruised or frayed skin, fascia, muscle or other elements.
4. Antiseptics strong enough to kill the organisms are also strong enough to kill the organism, and no farmer-doctor within hearing is fool enough to kill vines by any solution used to kill the bugs. That is just not done by gardeners but is still done by some doctors.
5. Soap and water, and more soap and water, and yet more soap and water is the best cleansing agent, plus gasoline for grease or tar.
6. Beware antiseptics with gaudy colors, or hard-to-pronounce names, or high-falutin formulas, or fancy labels, or attractive advertising, or liberal samples, or spats-bedecked salesmen, or endorsements from the mighty who rarely see your kind of injuries. Giddy colors may be good for chromatic, but bad for traumatic surgery.
7. If you must use an antiseptic, use it for first aid, before and after the soap and water cleansing, but not as a substitute therefor.
8. Drain every accidental wound, using a strand of suture material, a rubber band, or a pipe cleaner. Use no gauze drains unless there is a need for hemostasis or ballooning, and, if so, soak the gauze in soap suds, olive oil, camphorated oil, albolene or vaseline to prevent sticking.
9. Suture sparingly, and in any confused laceration treated by debridement place but do not tie the

* In *Southern Surgery*, quoted in *Illinois M. J.* June, 1935.

DEPENDABLE PROTECTION

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It's the hidden quality that produces the fine results accomplished by Willson Dustite Respirators in industrial dust disease prevention. Two respirators may resemble each other in exterior quality as closely as "peas in a pod," and yet one of them may approach the ideal respirator providing protection, comfort, face seal, low breathing resistance over a period of use, no interference with vision, no rebreathing exhaled air, economy and other features. This respirator is suitable for the most hazardous job, and the other which provides only one or two of these features might be good for only the least hazardous job, or none at all. In every Willson respirator goes the practical and scientific knowledge that has required years of time and thousands of dollars to acquire. We are always glad to cooperate with the industrial physician in the preparation of recommendations for unsafe conditions.

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The respirator illustrated above is the new Willson No. 400 Bag Respirator approved by the United States Bureau of Mines. Its 40 square inch filtering surface affording low breathing resistance, assures utmost comfort and promotes constant use by workmen in atmospheres of dangerous dust. Total weight of No. 400 is slightly over 5 ounces. The Willson approved long-life filter solves the filter replacement problem: occasional blasts of compressed air played into the bag keep it effectively clean; it is almost sure to last as long as the respirator.

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Böhler---TREATMENT OF FRACTURES

By DR. LORENZ BOHLER, Director of the Hospital for Accidents, Vienna; Lecturer on Surgery, University of Vienna. Translation from the fourth enlarged and revised German edition by Ernest W. Hey Groves, M.S., F.R.C.S., Emeritus Professor of Surgery, University of Bristol. Buckram binding, gold stamped, 6½ x 10¼, 588 pages, 1059 illustrations, $12.00.

LORENZ BOHLER has long been internationally famous for his many successful developments in methods for the treatment of all kinds of fractures. The German editions of his book are well known in America, but their use has naturally been restricted by the limitations of language. Even a fair reading knowledge of German is not sufficient for a complete grasp of principles or a reliable understanding of details of technique. Many American surgeons have wished for a complete and reliable English translation of Dr. Bohler's work, and one is now ready. Not only a complete translation of the fourth German edition, but added material, not previously published, from Dr. Bohler's latest experience with Fractures of the Spine, and of the Neck of the Femur. Not a dull machine-like translation by an uncomprehending literary hack, but a work of appreciation done by a man who is himself a well known master-surgeon. Ernest Hey Groves, editor of the British Journal of Surgery, an authority on fractures who deliberately postponed revision of his own excellent book on the treatment of fractures in order to pay tribute to the Viennese master of the art, and make his work better available to all English-speaking surgeons. It has been well said that Dr. Bohler's book reveals he has that quality of genius which consists in the infinite capacity for taking pains. **All of** his painstakingly acquired knowledge and experience is now available to every American orthopedist and general surgeon.

Bohler's methods are not experiments but a carefully compiled and developed system, superior to that commonly in use, covering many years experience with a large number of cases. Many American practitioners have visited his hospital where thirty to forty visiting surgeons from all countries watch his work daily. In fact the Bohler experience and methods have been for several years increasingly used in many American cities with success and satisfaction. In the words of a well-known California surgeon, "These methods, applied in the treatment of injuries result in a lessened disability period, an earlier return to the proper industrial status of the patient, a shortened period of hospitalization, and the least possible impairment of function. The morale and physical well being of the injured are enhanced and economy to society ensues."

No surgeon should rest content until he has a copy of Bohler on his bookshelf for reference, for comparative purposes to aid him in improving his own methods and technique. The book is a liberal education in fracture treatment.

WILLIAM WOOD & CO. (Division of the Williams & Wilkins Co.) Baltimore

sutures until the end of the third day. In the interval cover the area by a sterile wet dressing of iodine-saline solution (Tr. iodine one dram, saline solution one pint). This is the so-called "delayed" or "primo-secondary" suture, and there is no more important phase of traumatic therapy than this. It is the treatment for compound fractures. If we wait three days before tying the sutures, we can then be certain as to the sterility of the wound because the usual pus-producing organisms run their life cycle within that time.

10. Exercise especial care in wounds of the hand; next be careful in hair-bearing zones.

11. In infected wounds, do not incise for redness, nor red streaks, nor swollen glands unless there is localized pain, localized fluctuation or localized induration.

12. Infections can often be localized by hot, wet, massive gauze dressings of tap water, saline solution or magnesium sulphate. Keep the dressings moist by inserting into the meshes a perforated rubber tube and into this introduce the solution. Keep it hot by an electric bulb or an electric pad.

13. When incising for infection, make the incision long enough and deep enough to provide self-gaping, for if gauze has to be used for keeping the edges apart it will soon plug up and seal the orifice. That is taxidermy, not surgery.

14. In the granulation stage, exposure of the wound to open air, sunlight and electric light will bring about smoother and quicker healing than forced healing through the agency of wound fertilizers, such as balsam of Peru and others. Try this method in your next case, and at night cover the wound with a dressing of equal parts of sterile olive oil and camphorated oil. Sunlight and sea water are the best natural healers.

15. Keep the area affected at rest for the first three days during the presumtive infection period; but thereafter move it to promote circulation and to avoid contractures.

16. Keep dressings off wounds above the neck; indeed, it is a good thing to keep dressings off any area when protective coverage can be provided by a wire frame, or celoglass or some glorified vaccine shield device.

The Use Of Salt In Drinking Water To Prevent Heat Cramps and Fatigue

FOR THE benefit of those not acquainted with heat cramps I might say it is a condition usually seen in the summer, in men doing muscular work in high temperatures. It is characterized by painful contractions of the muscles, usually of the hands, arms and legs. Sometimes the muscles of the body and even those within the abdomen are involved. Until recently, hardly a summer passed without one or more deaths occurring among the steel workers at Youngstown. In the 10-year period from 1923 to 1932 we had 10 deaths among the employees of the Youngstown Sheet & Tube Company. We had more than the other two steel companies in Youngstown because we had puddling furnaces and about 30 hand sheet mills and these two departments produced 90% of our cramp cases.

Heat cramps have been a serious problem to the steel mills of Youngstown for a great many years. In years gone by it was customary in the puddle mills, sheet mills, and tube mills to slow down and even shut down during the hot spells of summer. Fortunately for the men and for the industry business was usually poorest in the summer. One of the factors that probably influenced the incidence of cramp cases was the fact that the men were paid on a tonnage basis in those departments that produced most of the cramp cases. Another factor which also contributed to the incidence of cramp cases was the pride these men had in their physical powers. They not only desired to turn out the tonnage but also disliked to acknowledge before their fellow-workers that they couldn't "take it."

After the warning signals had appeared and had been disregarded, and the men continued to force themselves to work in the heat; death was too frequently the result.

The installation of large man-cooling fans a little more than 10 years ago reduced considerably the occurrence of heat cramps. The use of these fans, I believe, was first introduced in the U. S. Navy to cool the stokers, among whom there was a high incidence of heat cramps.

The next forward step was made when tablets of ordinary table salt were distributed to the workmen. Although for many years it was customary for some of the puddlers and sheet mill workers to carry salt cellars and take small quantities of salt during their working hours, it has been only in recent years that salt tablets have been distributed among workmen as a preventive measure.

Shortly after the salt tablets were introduced some of the hot industries began to use glucose, which might well be called digested starch. It is the form to which the starches are reduced by the intestinal juices before being absorbed into the blood stream. Its introduction in the treatment of heat cramps by injection into the blood stream was the result, I believe, of its adoption in the treatment of patients in shock following operations or serious injuries. Patients with severe heat cramps often show the picture of shock—weak, rapid pulse; temperature below normal; marked decrease in blood pressure; and profuse perspiration.

While some of the hot industries are using salt, others are using glucose, and still others are using tablets containing a combination of glucose and salt.

Although heat cramps have been described in the medical literature for about a hundred years, there has been to my knowledge no real laboratory work done to determine the actual changes in the body, until the last few years.

In 1933 we had a situation in Youngstown that sooner or later would have called for a show-down among the industrial doctors. All three of the large steel companies in Youngstown send their patients to the same hospital. We have two adjacent wards that years ago were set aside exclusively for mill cases. Often these were insufficient to care for all the mill cases, and there was a frequent overflow into the other wards of the hospital. Thanks to the progress of safety in the mills, only one of these wards would be sufficient most of the time for our mill cases.

At one end of the town a steel mill was distributing glucose to the workers. At the other end of the town a steel mill was distributing salt tablets. And in between these two another steel mill was distributing both and leaving to the workmen the choice of the two. In the hospital the heat cramp cases from two mills received glucose treatment; and the cases from the other mill received glucose but in large amounts of salt solution. The standard glucose injection given into the veins was 25 grams of glucose in 250 c.c. of water, roughly a half pint; and these injections were given several to eight hours apart. The combination treatment followed by one of the mills was 50 grams of glucose in 1000 c.c., a little over a quart, of .9% salt solution. Rarely was it necessary to give more than the one injection.

With patients in the same ward being treated for the same condition with different solutions and in amounts obviously at great variance, there could not but develop discussion and comments by patients, nurses, interns, and visiting doctors.

IN MARCH, 1934, the writer read a paper to the hospital staff cover the work of the Harvard Fatigue Laboratory at Boulder Dam.

In 1931 work was begun on this gigantic project in the desert. During the first summer there were 17 deaths among the workers who had come in from all parts of the country. The Department of the Interior requested Harvard University to send their fatigue laboratory workers out to Boulder in the summer of 1932 in the hope of solving this serious situation. Before 1932 the Harvard group had been engaged for several years making studies of the reaction in human and animal bodies to fatigue produced on exercising apparatus under different regulated atmospheric conditions. They had also studied workmen in the mountainous regions of South America and in the Panama Canal Zone.

With this background of experience they began their studies on the men at Boulder Dam. Living conditions of the workers were much improved over what they were in 1931. Instead of the men living in camps down in the gorge, they lived some miles away from the gorge, in good well ventilated dormitories. The food and recreational facilities were also very much improved. There was more care used in the selection of the employees and there had been an opportunity for the men to become acclimated. During the summer they were there only seven cramp cases developed. A very thorough study was made of these cases and the laboratory findings were identical, so far as significance was concerned, as

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* DR. P. H. KENNEDY, Medical Supervisor, Youngstown Sheet & Tube Company, Youngstown, Ohio; paper read before the Engineering Division of the Chicago Safety Council, July 18, 1935.

those obtained on the steel mill cases in Youngstown in 1934. While at Boulder they also made a number of studies on the men at work as well as on themselves, and did some animal experimental work. Their conclusion, based on the seven cramp cases studied at Boulder, was that the cramps were caused by the loss of salt from the body.

After hearing the paper covering this work at Boulder Dam, the Youngstown Hospital staff immediately started correspondence with Harvard University in the hope of getting the research workers interested in coming to Youngstown for further study of heat cramps. We had had 90 cases in the South Side Unit of the Youngstown Hospital in the summer of 1933; and the promise of a great wealth of material for research work was too alluring for them to turn down. The Sharon Steel Hoop Company, the Republic Steel Corporation, and the Youngstown Sheet & Tube Company, all having their executive offices in Youngstown, we were able in the short time available to get sufficient pledges of money to finance our end of the expense of the work.

Because of their previous study of cramp cases at Boulder Dam the Harvard doctors came to Youngstown prejudiced in the belief that the cramps were due to salt loss. There was considerable opinion among the Youngstown doctors that glucose was the solution of our heat cramps problem and the Harvard research group were not long in finding that this belief prevailed. They therefore started in to give glucose its test on their first severe cases.

There were about 70 cases in all that were studied in the cramps ward. Half of these were heat exhaustion cases and half of them had real muscular cramps. Blood and urine were studied exhaustively on all the cases. The patients were weighed immediately on admission and daily thereafter, an arterial blood specimen was taken, and a urine specimen obtained.

The mild cramp cases received no special treatment other than rest in bed. They all got well. The fact that these mild cases and some moderately severe cases got well with no special treatment whatever except rest, suggests the belief that some remedies have received support because of their use in cases that would have got well without any special treatment other than rest.

The first severe case they received was a very husky negro who had not worked for three years, and had come in at about the end of his first turn, which happened to be on one of the hottest days in June. He started in to work as an opener in the sheet mill. He had cramps throughout his legs and arms, and they were so severe he could not lie in bed. He was permitted to stand beside his bed because he could stand the pain better. He was given three injections of glucose into his veins two hours apart with no relief. He was then given salt solution into his veins and required no further treatment. This procedure was followed in a number of the severe cases without any difference in the results. Laboratory reports on these cases also showed no need of glucose.

Different combinations of normal blood salts, other than sodium chloride, were tried, but none of the various combinations was found to be of any advantage.

The clinical study on the ward resulted in the recommendation that salt solution .9%, be used for the treatment of these cases. As much as two liters, a little more than half a gallon, may be given into the veins. The contention was made during our weekly meetings that salt solution had been used years ago and found wanting. The Harvard doctors began a study of the histories of the cramp cases treated in the Youngstown Hospital for the previous 10-year period and found that, although salt solution had been given, it was given in small quantities, usually not over a pint, and in the fatal cases as a rule it was not given until just before death.

In those cases handled by the reseach workers, when salt solution was being tried, a little more than a quart of .9% solution was given intravenously. This was sufficient to give prompt relief in nearly all cases. There were but few who required more than one injection, and none required a third. At different periods after giving salt solution, attempts to produce cramps were made by asking the patients to use their leg and arm muscles against resistance. In those cases treated with salt solution it was unusual to find that cramps could be produced a few hours after the salt solution had been administered.

THE day after the cramps ward stopped taking cases we had a cramps case come in at the Sheet & Tube Hospital. The cramps were not severe and I ordered the patient put to bed, thinking that a few hours rest would be all that was needed. This was done just as I was going to lunch. Upon my return about 45 minutes later, I heard considerable commotion in the ward and upon entering the ward found the nurse, janitor, and maid all struggling with the patient trying to force him back into bed. He was suffering from severe cramps in both arms and legs, and like some other such cases, figured he would be better able to stand pain or get relief by getting out of the bed. He was finally subdued and put to bed and morphine given hypodermically, and the ambulance called. On reaching the Youngstown Hospital he was still trying to toss himself about in an effort to get relief from his cramps. Another hypodermic of morphine was given to try to quiet him for the administration of salt solution into his veins. In spite of these two injections of morphine the cramps continued and he frequently had to be held down during the administration of the first quart of salt solution. Up to the time he received 900 c. c. salt solution his whole body was sweating profusely; then the sweating stopped and except for an occasional cramp in his left calf he felt no further disturbance. The salt solution was continued until he was given 2000 c. c., or over two quarts. At the end of the salt injection no cramps could be produced even though with straightening out his leg he pushed hard enough against me that I slid along the floor. Upon my visit to the hospital five hours later instead of finding my patient lying quietly in bed exhaused from the ordeal he had been through, he was sitting up in bed very much perturbed because he was not allowed out of bed, and had been told that he would have to remain in the hospital over night. We gave nothing but .9% salt solution into the veins to the rest of our severe cramp cases the remainder of the summer, and found that our cases all quickly recovered. Only the severe cases were treated at the Youngstown Hospital. The mild and moderately severe cases we have treated at our plant hospital and first aid stations by putting them to bed for a few hours and giving as much as a half ounce of salt with all the water they care to drink, and then sending them home for the rest of the turn.

The laboratory work which was under the direction of Dr. Dill, a biological chemist, was very extensive. Samples of arterial blood and urine specimens were obtained on admission; and each day the patient remained in the hospital other blood specimens were taken and all urine passed was collected and examined. There were about 20 separate tests made of each blood specimen, and almost the same number of tests made of the urine samples. The admission of two or three patients in the late afternoon meant steady occupation by Dr. Dill and his assistant until midnight.

The significant finding in all the cramp cases was the drop in the blood salt. This varied from 5% to 14% below normal for all but one case, and this case showed a drop of a little more than 20%. In the admission urine specimens there were found but slight amounts of salt, and some specimens were almost devoid of salt.

The cramp cases showed on an average less than 3 g. salt per liter of urine. It was felt the calculation of the salt in the urine which can be determined in a few minutes by a competent laboratory technician would be a comparatively reliable index of the severity of the patient's condition. The reliability of this test would depend on the time that the bladder had been previously emptied. If there had been no emptying of the bladder since the man had started to work, the urine produced during the first hours of work might contain the normal amount of salt. If this were not emptied and remained to mix with the comparatively salt-free urine coming down from the kidneys during the profuse sweating preceding the cramps, it would give the urine a salt value that would not be entirely dependable. However, if the patient has voided within a few hours of getting cramps, the salt content of the urine is a reliable index of the salt loss of the blood.

In addition to the work done on the hospital cases, there were some tests carried on in the plant. Temperature and humidity readings were taken and studies were made on

the workmen. A number of sheet mill crews were weighed naked before starting to work. Their urine was collected for 24 hours. The amount of fluid intake during their work period was measured, and the men reported the total fluids taken during the remainder of the 24-hour period. Blood specimens were obtained at the end of the work period. The significant fact of this work on the crews was the fluid loss through the skin of as much as 20 or more lbs., or 2½ gallons of sweat during the eight hour work period. The men averaged about 15 lbs. of fluid intake during the work period and on plain drinking water ended the day with a loss in weight averaging 5.6 pounds. On drinking water having a salt content of .1%, about one level teaspoon to the gallon, there was an average loss of 1½ lbs.

As a result of these studies in the plant it was recommended that we salt our drinking water in the summer months, .1% as a preventive measure against cramps. This amount of salt will not replace all the salt lost in sweating. In an average diet one receives from ⅓ to ½ ounce of salt, and in the absence of sweating almost the same amount will be excreted in the urine. Sweat continues on an average of .1% salt. With an excretion of 20 pounds or 320 ounces of sweat, one would excrete almost ⅓ of an ounce of salt, or the total low value of salt content in the average diet. The amount of salt in the sweat varies both in the different areas of the body, and in individuals. Howell's Physiology gives a variation in sweat of individuals from .06% to .5% salt. In the work done by the Harvard group at Boulder Dam the sweat of a number of individuals averaged .116% salt.

Giving .1% salt will not prevent all cramp cases. It would not be sufficient to keep the salt content normal in those individuals having a high salt value in their sweat. It would not be sufficient for those entering upon real hot work for the first time in the midst of the summer; for it was definitely shown by the Harvard group while at Boulder Dam that it takes three to five days for an individual's sweat glands to lower the salt content of their secretion. And likewise it only takes three to five days away from a hot environment for the sweat glands to lose their ability to conserve salt. So that for those who are entering hot work for the first time, or after an absence from their work for a week or longer, additional salt is recommended. We also expect to find cramps occurring among those experienced hot workers who have been on drinking bouts, or have had diarrhoea, vomiting, or have been engaged in sweating occupations outside their working hours. The man who has been on a drinking bout as a rule has not been eating well and has permitted his body salt to be depleted and come to work with little or no reserve salt in his body. All body fluids contain salt, and an attack of diarrhoea or vomiting may deplete considerably the body salt. Taking part in sports or working on a farm, or doing other work without a sufficient period for recovery of salt loss, may send a man to work in a predisposed conditions for cramps. It would be well for all those in charge of men working in high temperatures to be especially careful not to permit men to work who are not well. During this depression when work was so scarce, foremen were accustomed to turn their heads away when they found men unable to perform their tasks, because of illness, and permitted others to help them out so that the men could complete their turn and draw full pay. Some of our worst cases occurred under such circumstances.

IN CONCLUSION, I regret to say that there were no significant deviations from the normal in the laboratory work done on the pure heat exhaustion cases. The work was set up and undertaken primarily for the study of heat cramps. Heat exhaustion cases received the same study, but there was nothing significant in either the laboratory or ward study of these cases that would enable us to prevent these cases occurring. It was suggested that these cases might be the result of poor heart reserve. With the vessels over the surface of the body all dilated so as to permit the greatest amount of blood to get to the surface for cooling, the work demanded of the heart in keeping up the blood flow in this enlarged stream-bed is probably beyond the capacity of the heart. If the day comes when industry adopts thorough periodic physical examinations, we may be able to prevent heat exhaustion cases by more intelligent placement of men.

The most common objection to the introduction of salt in the drinking water by employees is due to the fact that practically every employee knows some person who has been denied the use of salt in their diet on account of high blood pressure or kidney trouble; and it is a common belief, not only among the employees, but among the average practitioners of medicine, that salt has a deleterious effect on the kidneys.

In 1920 an article was published* by a doctor who claimed that high blood pressure was due to the excessive use of salt. While no article has been published, to my knowledge, in the same magazine either sustaining or refuting this idea, there are articles in other medical scientific journals which refute this idea. Dr. O'Hare, of the Peter Bent Brigham Hospital, in Boston, made a thorough study of the effect of salt in his high blood pressure cases, and could find no support whatever for the idea that salt is the cause of high blood pressure. He concluded that the only benefit derived from the prohibition of salt in the diet of high blood pressure cases was the cutting down of the diet of these patients by making their food less palatable.

The use of salt is rightfully prohibited or markedly reduced for those patients who have swelling of the body tissues, especially the legs, when this swelling is due to the detention of salt in the tissues, but such cases are never found trying to do manual work and are usually in such bad condition that it takes quite all their strength to get about in their own homes.

It will probably be of considerable interest for you to know that in an ordinary bowl of soup, such as tomato soup or vegetable beef soup, one would obtain as much salt as one would receive in three or more quarts of .1% salt solution.

When you consider that our sheet mill workers, on very hot days, drank only two gallons of water in the whole eight hours while at work, and these men perspired profusely during the whole eight hours, it is quite probable that the average mill worker does not drink more than two or three quarts of water during the eight hours, and if you will explain to them that they will not get any more salt than they would get out of a bowl of soup, I believe you will have little difficulty in convincing them that there will be no harm come to them from drinking .1% salt solution. If this water is kept below 50° F., preferably around 45° to 46°, it will be impossible for them to detect the salt.

For many years there has been a fear that cold water would give the men heat cramps, and it has been customary to keep the drinking water around 50° to 52° F. in the steel mills. The men have always protested against having to drink water at such temperature. The management has consistently refused to permit the water to be cooled to less than 48°, because of the fear of cramps.

We have had our water down as low as 40° this year in extremely hot weather and produced neither a cramp nor a physical exhaustion case among our sheet mill workers.

The only danger I see at present in giving the men the water real cold is that they might not drink sufficient water. If this should happen the sweating would be less, perhaps, than desirable; and the cooling effect of sweating would be thereby reduced and the body temperature would probably increase. However, I believe it is perfectly safe for the water to be cooled to 45° to 46°, and we shall have an opportunity this summer to learn which is the most desirable temperature to be sure that the men take sufficient water.

It might be well for golfers to add a salt highball to the 19th hole indulgence. A scale in the locker room would be a good addition to any golf course. Salt is responsible for two-thirds of the body's ability to hold water. A reduction of weight of more than a half a pound during a golf game might well indicate the advisability of taking a level teaspoon of salt in a glass of water instead of the usual highball.

*J.A.M.A.

Know Your Contracts!*

LET us suppose it is one month before your internship is completed. You gaze into the not-so-distant future with apprehension. The outlook is hazy. You cast about in vain for the proverbial eminent physician who is about to retire and

* Herbert L. Herschenson, M.D., in *Medical Economics*, July, 1935.

pleads with you to take his luxurious offices and enormous practice.

The mirage finally disappears and you stand alone in the desert of uncertainty. You do not know where to locate your office. You do not know what to expect when the office is opened. Your doubt grows greater as the days close in upon you.

Suddenly, in the midst of your dilemma, someone graciously places in your lap a lucrative position with a nationally-known industrial plant. Would you recoil in horror, remembering the warning some professor gave the class against accepting a position of this kind because it keeps the physician in a rut? Or would you seize the golden apple and hold on to it for dear life? I seized!

THE proposition was simple. Only three hours a day were to be devoted to first-aid dressings and general medical care of the employees at the plant. The rest of the time could be devoted to a private practice.

If, incidentally, one of the employes should ask for medical or surgical attention at home he would be entitled to the service for which I would receive no extra remuneration. "Think of the opportunity of building up a practice by meeting these dozens of workmen daily. Your name will be known to everyone. You will be their first consideration."

I was--to my sorrow.

The method of operation, I soon found out, was as follows: Each month a little of the employee's salary is contributed to a general medical fund out of which all medical expenses are paid. For this trival sum the employee is entitled to hospital care, major surgery, and complete medical care, including house calls and prescriptions.

The house calls were a mere incident in my contract. So mere, in fact, that there was no time left to devote to a private practice. The telephone rang incessantly.

"Doctor, my husband works for the So-and-So Company. He is very sick. Better come quickly." Nothing to do but make the call. Getting to the home of a sick employee in less than squad-car speed left me open to censure by the plant executives if I were reported. By the time I returned home I would be greeted by another handful of telephone calls—all part of the contract service. Whatever private calls filtered in were pushed aside.

If the following were an isolated case, the situation might be considered humorous, but its frequency was so great that it became a source of chronic irritation:

It is two o'clock in the morning. The plague of civilization starts ringing with intermittent, monotonous persistence. Paralyzed muscles refuse to move the aching bones but somehow the telephone is answered. Another contract call. Every traffic law is violated to reach the patient's house before it is too late. When I arrive, what do I find? Something like this:

"Doctor, I can't fall asleep. I have a bad headache. Can you give me something—maybe some aspirin."

My disposition turns slightly sour.

"Why didn't you take the aspirin before calling me?" I suggested.

"I didn't have any, the drug store is closed. And besides," the patient adds somewhat indignantly, "I'm entitled to this service."

Entitled to this service! Words fail to express what a person like this **is** entitled to.

This evil of contract practice is nothing when compared with the chicanery often employed to secure medical attention for members of the family or neighbors who have nothing to do with the company and are therefore not entitled to any of the contract service. Yet all too often the physician is duped before he becomes aware of the imposition.

It is obvious that this type of medical contract is decidedly unfair to the private practitioner to whom these patients, when actually ill, rightfully belong. It gives the employee medical service entirely out of proportion to the amount expended. The company enjoys a good profit from the enterprise, too, considering the number of employees who contribute to the medical fund but do not ask for the service, and in view of the small salary paid the physician for his large volume of professional work.

The private physician resents this invasion upon his sole means of livelihood. He eyes such a contract physician with enmity. A state amounting almost to civil war exists within the profession. It is a pathetic state—pathetic because the contract physician does not relish the encroachment he is making. It hurts his feelings to be viewed with antipathy by his colleagues. Still, he must carry out the policies of the company by which he is employed. It is difficult to relinquish a definite salary for the questionable income of a private practice. He has fallen into the rut he was warned against, and there is only one way out: resignation. I chose to resign.

The bite of the industrial medicine bug leaves enduring effects. When an opportunity flaunted its presence before my eyes once more, I scrutinized it, remembering the poisonous inoculation received from the first bug. But this one belonged to an entirely different species. It was beautiful to behold. And harmless. I succumbed under its spell.

The alluring feature of this new contract service was the positive absence of medical and surgical treatments for conditions other than those for which the company was directly liable. All accidents incurred during the hours of employment were to be given first-aid, and wounds cared for until entirely healed.

Accidents incurred outside of the hours of employment have nothing to do with the company and, consequently, nothing to do with the company physician. The injured employee is instructed to see his private physician. The same applies to medical conditions.

Headaches, digestive disturbances, and similar ailments of minor and momentary nature which distress the worker during his hours of employment are corrected. Beyond this field the scope of the company physician's duties does not extend. Even in the treatment of industrial injuries which require specialized handling, such as penetrating injuries of the eyeball, the employee enjoys the privilege of choosing his own specialist if he so desires and if the one chosen is recognized as capable.

This arrangement is ideal from every standpoint. The employee retains his full wages. Nothing is taken away from him for a medical fund. The workman is given every consideration due him by reason of his employment. Contract medical services of this kind is in accord with medical ethics and sound economics.

Above all these virtues stands the fact that the private practitioner does not suffer in any way. Nothing is taken from him. On the other hand, it frequently happens that the company physician refers patients to many of his colleagues because he cannot handle a private practice during the hours of his own employment. Here the feeling between the contract physician and the private physician is one of alliance.

Thus a clear distinction is drawn between the two outstanding types of contract practice. It is a distinction which experience proves should be kept in mind by every physician.

A world of difference exists between the contract under which a company taxes its employees for complete health insurance coverage and the contract that is limited strictly to the treatment of employment-connected ailments.

If more medical men understood this clearly — particularly the new arrivals in the profession — there would be less exploitation of physicians by industry and fewer disillusioning experiences of the kind recounted at the beginning of this article.

Mental Hygiene as Applied to Industrial-Accident Prevention

OUR present methods of accident prevention* are based on the presumed need of awakening employees to a sense of responsibility for their own safety. To do this, we spend considerable time trying to scare them into looking out for themselves. Posters showing the horrible results of accidents are prominently displayed. Speeches are made in which the suffering at home as a result of loss of income is vividly explained, and articles are written telling large groups of workers to "do this" or "do that" to avoid dreadful consequences. A number of the individuals for whom this propaganda is prepared pay complaisant attention —and then apply the lesson to some one else. Our general educational campaigns are, no doubt, leaving many things undone.

According to the best authorities, at least 85 or 90% of all accidents have as their proximate causes the mental conditions of workers. This estimate relegates the remainder of the accidents to machine or material failures, "acts of God," and various more or

* EDWARD R. GRANNISS, Travelers Insurance Company, Hartford, Conn., in *Mental Hygiene*, July, 1935.

less indefinite causes. The mental conditions that result in error are lack of knowledge, inattention, confusion, and often an unwarranted sense of superiority typified by the "it-cannot-happen-to-me" attitude. These terms, of course, overlap and are dependent for their existence on a number of things, such as experience, training, worry, fear, fatigue, exhilaration, or some mental subnormality, all of which tend to expose the individual worker to hazard.

Accident investigation and analysis usually stop at the first cause, in as much as most plants are not equipped for further analysis and their executives believe it impracticable to go into psychological causes further than to note that the man was inattentive, disobedient, or, perhaps, careless. Records of this kind are of value in safety work, but do not by any means give a full analysis of an accident.

Industrial accidents are not distributed among workers according to the laws of chance. In plants in which records have been kept for a considerable period it has become evident that the workers who have the most accidents (accident prones) will, generally speaking, be found to be the ones who make the most errors in their work, who have the poorer attendance records, and who react more slowly—or more unwillingly—to supervision. Thus, while complete accident records probably offer the easiest method of identifying employees who are misfits in some department of their work, by correcting the mental attitudes of accident-prone employees far more is gained for the plant than a reduction in its accident record.

What should an industrial mental-hygiene program be? Or, rather, what can it be? An ideal can be set up; if it cannot be attained, does it necessarily follow that nothing can be done? First, it must be realized that industrial psychology is not a form of hypnotic suggestion by which employees can be kept happy while receiving abnormally low wages, or made resistant to fatigue through long hours of monotonous labor. As a medium for assisting in the correction of improper attitudes on the part of individual workers, or of increasing the comfort and, incidentally, bettering the morale of a group of employees, there are, generally speaking, three courses open to the average plant.

First, there may be a department of mental hygiene under the direction of a psychiatrist. Such a department will perform the most fundamental work. A psychiatrist, with his specific knowledge of human motivation, appreciates the significance of various attitudes, and can discover and treat mind conflicts, repressed desires, feelings of inferiority, and various forms of neurotic incapacity. He can judge the amount of incentive, industry, and ambition in a new employee, and can obviate, to a large degree, vocational misplacements.

Second, an industrial psychologist may be added to the health-department staff. This should be a person with some medical school background who has specialized in mental hygiene and has had clinical experience with mental cases—one who can recognize the tastes, capacities, and requirements of workers, together with their susceptibility for training. A psychologist can determine speed of mental operations, accuracy of performance, quickness of perception, manual dexterity, and ability to remember.

Third, if professional psychiatric or psychological service — which, of course, is the ideal—cannot be procured for a plant, certainly some good can come from a consideration of the mental causes of accidents by proper persons even though they may not be professionals. A department of vocational guidance may be set up. The procedure followed may be similar to the work of reorientation in many of our colleges and universities, in which one of the older professors, with a liking for young people and an ability to win their confidence, spends much of his time, while away from his classroom, in personal interviews with students with troubled minds. Perhaps the new student has not reacted properly to his wholly different social environment; perhaps he is unable to reconcile his past religious outlook with his new studies in science; or perhaps he has chosen a group of studies that are wholly foreign to his interests and in the pursuit of which he will never be content. The advisory professor, through years of watching young people come to college and leave—either as successful graduates or as scholastic failures—has acquired a knowledge of the causes of such success or failure, and so is qualified, by disposition and experience, to offer suggestions as to different and more suitable courses of study. Many a youthful student can attribute his success at school or college to such a confidential talk.

IN MANY factories there are men of high intelligence who have watched employees come and go and who have been observant enough to realize why many men were discharged as failures. There is no doubt that a man of this type, through the medium of personal interviews with employees who have high accident records, or who seem to be misfits or problem cases for other reasons, could, with the help of the plant physician, straighten out many confused mentalities and help to instill healthy attitudes. In salvaging a worker who would otherwise be lost to an industry, a service is performed not only to society, but also to the plant that has taken such initiative. Any worker who has gone through the process of being hired and trained for a job represents a very definite investment for the firm, which investment should be protected. Replacement does not always mean a better man. High labor turnover is a needless expense.

A department of vocational advice needs the cooperation of the employment office. Far more information can be gained at the time of the applicant's physical examination than is usually demanded. For instance, something can be learned concerning home conditions. The man's standard of living; his medical history; his manual dexterity and alertness; his tastes, desires, and ambitions; his disposition and training; his attitude toward certain principles of management with which he will be confronted — such as open shop, bi-weekly pay days, and no smoking—all can be used to good advantage in placing the applicant or in assisting him later should he get into mental difficulty.

We rarely analyze a man's attitude in connection with an accident. If it is found that he was disobedient or inattentive, he is told to mend his ways, and the matter is usually forgotten, even though the employee suffers further accidents from mental causes. The only action taken by some plants is to protect themselves by dismissing the man in question—if his accidents result in spoiled work.

Attitudes can be changed or molded. This was shown in our own country during the World war, when, through the use of patriotic propaganda, a peace-loving nation was in a short time changed into a very warlike people. Political parties are constantly molding public attitudes.

The attitude of the individual worker can also be changed, but this is usually a personal problem. Men often become obsessed with some idea that dominates all their actions. The idea may be born of a trifling incident that probably had little or no significance, but that, as a result of allowing the mind to dwell upon it, has become a matter of importance. Because a foreman was a bit gruff one morning, the press hand has come to believe that the whole company wishes him ill, and he develops a morbid disposition, disregards rules, and finally is injured or discharged. Another man—a bench hand—while returning home one evening, hears a fanatic speaking from a soap box. Some of the ideas expressed please him and he is now refusing to obey any of the laws of capitalists (personified to him by his employer) and is marking time until the hoped-for millenium, when the goods of the world will be equally divided. Such attitudes can often be corrected by a confidential conversation. In many a case, in fact, when a man can be induced to express his grievance, merely putting it into words causes him to realize its lack of importance, and he returns to his job feeling better than he has for weeks. Many accidents occur to men while they are in a depressed frame of mind.

An employee may lose interest in his job after he has thoroughly mastered it. Even though a man may for a time enjoy the work to which he was assigned on employment, his interests may change as he gains knowledge and experience, and an ambitious worker with a few years of service may justifiably be dissatisfied with the limitations of his present job. There was a time when many of us wished to become policemen or railroad engineers, but our changing tastes have brought us into wholly different vocations.

The personal interview with the accident-prone worker may also bring to light forms of mismanagement, poor training methods, or unguarded conditions which had not previously been known. The contact between workers and their immediate job supervisors is of great importance, and constant check should be made to see that a type of supervision is exercised that will give the employees as wholesome an atti-

tude as possible toward their jobs.

The plant interested in industrial psychology will also keep informed of the accident records of particular groups of persons. The physical surroundings of the workers may be partly responsible for bad records and should receive consideration. Uncomfortable working conditions are likely to create discontent and disturbed mental attitudes in general. For example, avoidable noise, poor light, unsatisfactory drinking water, unclean personal-service equipment, and impure air, all tend to cause annoyance and fatigue. The tired worker is usually the first to show irritation, which may be manifested by insubordination and disregard of safety rules.

It is sometimes necessary to control fatigue arising from other sources, too. Excessively long hours on a single operation (for some types of workers), rapid pace, insufficient rest periods, muscular overstrain, nervous tension, inefficiency, and lack of training result in reduced output, spoiled work, and accidents.

Weariness is often associated with boredom and distaste for the job on hand—in fact, there is little to choose between physiological and psychological fatigue, so far as the respective results are concerned. The treatment, however, once the source has been determined, may be quite different.

Fatigue of a physical nature is such as may be experienced by a farmer after 16 hours of manual labor. It can be overcome by sufficient rest, sound sleep, and suitable food, and is usually productive of a strong, healthy body. Mental fatigue (better termed "staleness" or "strain") in industry is quite different and far more harmful. It is produced by work that puts a strain on one part of the body, to the exclusion of other parts. For example, an inspector may be tired from eye strain before his work day is done, and yet may have a large store of energy for a ball game after quitting time. It is from lack of proper exercise that he sometimes tires in the ball game and not from the work he has done during the day.

A change of employment, whether for an hour or two or for several months, is often as good as a rest. Many a person who has shown symptoms of a nervous disorder while working in a department filled with noisy machinery has fully recovered in the quiet inspection department on the top floor. On the other hand, a job of physical activity for a short period is refreshing to a person who is accustomed to sitting down and working only with hands and eyes.

Accident and production records have been improved by a few minutes of deep breathing and light exercise in the middle of the morning and afternoon work periods. For employees who are using up considerable energy, strength is sometimes quickly restored by a little sugar, and many plant superintendents have found it advantageous to have candy or other sweets distributed through various departments at some prescribed hour.

The work of the mental-hygienist is an addition to the usual accident-prevention program, which includes safety meetings, posters, mechanical and physical safeguarding, and first-aid training. This general activity, directed against the predominating accident causes of industry as a whole, is necessary, because the majority of men are more or less alike in their habits. A warning against oiling or adjusting machinery while it is in motion will appeal to most employees. The worker who wilfully disregards a simple caution of this kind is the problem case that needs special attention.

We know that progress has been made when accident and production records improve in a department, following the introduction of a new type of mental relaxation; and also when the mishaps of an employee who has previously shown a proneness to accidents become less frequent after he has been properly interviewed. If mental attitudes are the causes of most accidents, surely it would be worth while to devote more of our time to probing farther into this particular phase of safety work.

Nursing in the Automotive Industry

THE author* is one of the corps of six registered men nurses of the medical department of one of America's major automobile assembly plants employing 4,000 men daily. Directed by a resident surgeon, we minister to an average of 3,000 accident, industrial and non-industrial disease victims a month. Because of the many other strictly nursing duties performed here, the doctor combed the field of registered male nurses to organize his efficient staff. The equipment of each consists of psychiatric and general training, institutional and private duty experience, and commercial education. Even if there should be but one nurse available at a time, our surgeon has in him a chauffeur, investigator and secretary.

Preliminary Employee Examination

WE ARE as much concerned with the prevention of accidents as we are with caring for the injured and sick. With the advent of the rush season, the various foremen saunter out to the gate and select from the hordes of job seekers an average of 70 applicants daily, many of whom are former employees. Regardless of the position he seeks, every applicant, except those who have not been out of our employ for more than two months, must submit to a complete physical examination before he is accepted by the employment bureau. One nurse seated outside the dressing room inspects the credentials provided each applicant by the placement officer; a second nurse examines his eyes, a third performs a complete urinalysis, a fourth conducts him into a dressing booth, instructs him to strip down to bare feet, weighs and measures and escorts him into the physician's office. Here he is examined for circulatory, heart, lung, gastro-intestinal, nervous and mental diseases, abnormalities and deformities. Even if the physician discovers the applicant is physically or mentally unqualified for employment, his record is preserved permanently just as if he had passed with a 100% rating.

While this examination seems costly, in reality it is a great economy, benefiting the employer, employee and the insurance company. It prevents the incompetents from being assigned jobs and eventually endangering the lives of others and directly affecting production. It prevents the chiselers from collecting on false claims of having suffered the loss of an eye, a finger, an arm, contracting a hernia or other injury while employed here. It also makes it possible for the handicapped to earn a livelihood, since the doctor advises the placement officer to assign such a worker to a job suited to his capacity.

Once the applicant has passed the physical examination, it is our duty to make certain that he understands the "Safety Advice" card which contains advice and rules on preventing accidents. Despite the safety devices throughout the plant, our lectures, the presence of the insurance company's safety engineering inspector and the placarding of safety warnings from one end of the plant to the other, accidents prevail everywhere but in our own department and in the main office. From the unloading of car parts in freight to the final inspection of the completed automobile, each operation in assembling a car has its peculiar hazards, inflicting characteristic injuries or industrial diseases.

Seeking First Aid

EACH employee seeking first aid must bear a supervisor's accident report. This document, signed by the foreman and never destroyed, is our heavy artillery in our constant fight to prevent accidents. It tells where, in what department, and when the accident occurred, the name of the injured and a description of the accident and nature of the wound, precluding any possibility of reporting injuries suffered outside of employment. It describes what unsafe act was committed, why it was committed, what unsafe condition existed, and what should be done to prevent similar accidents. When you find the injured man to blame, you lecture him on the value of practising safety measures, and similarly if a co-worker caused the accident. Where defective machinery or factory equipment is at fault, you report to the surgeon, who in turn discusses the matter with officials to prevent a repetition of the accident. Naturally, the injured man usually reads this report en route to the medical department and, if he is to blame, it has a good psychological effect on him, to the advantage of all concerned. From these reports we compile a weekly chart containing the number and percent of accidents in the individual departments and the plant as a unit. A copy of this is submitted to our surgeon, the factory service manager, the insurance company, the latter's safety engineering inspector and claim adjuster, the general manager of the factory and to the safety director in the main office; all of whom peruse the report faithfully and devise means of preventing future accidents and disease. Woe be to the foreman whose department shows an increased accident rate.

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* Wallace G. Pickering, R.N., in *Public Health Nursing*, August, 1935.

Following Up Injuries and Illness

WE COMPILE a complete and accurate record of every industrial injury and disease and non-industrial injury and illness. Every three days one of us invades the active file and removes the records of those who have failed to report daily for redressings or treatments. Armed with these cards, the investigator ferrets out the delinquents in their respective departments, ascertaining whether the injury requires further treatment, whether the patient has entrusted the case to his own physician, whether the patient has been discharged or quit his job. The result of each investigation is recorded on the record over the signature of the investigating nurse. Besides having a definite conclusion to each case, we thus keep infections and other complications at a minimum. Those who have neglected their injuries are warned to report regularly on the penalty of discharge. One finds various reasons for these delinquents; some claim their foreman refused them permission to visit the first aid room, some boast that they have adopted the fresh air cure, i. e., exposed their wounds; ignorance and carelessness also account for many delinquents. But regardless of the cause, it is our duty to remove it if possible. We must make workers appreciate the danger of neglecting injuries, and realize that the medical department is there for their benefit at all times. Where we find a foreman guilty of refusing an employee the privilege of reporting to the medical department, we file a complaint against him with the plant manager, and have no further trouble from this source for many months.

Appointment Cards

IN ORDER to keep at a minimum the time lost by the injured availing themselves of the benefits of our department, we provide each with an appointment slip for redressing or subsequent treatments or for consultation with the resident and visiting surgeons. This is a recent experiment that has increased the cooperation between the foremen and injured and us. Foremen naturally are suspicious of men requesting the privilege of visiting our department; they believe they use this as a ruse for sneaking up to the locker rooms for a sandwich. Thus when an injured man shows him the appointment slip the foreman is convinced that his request is legitimate, and will provide him with a relief worker. Without the latter, one man leaving his specific operation would hold up the entire production line, for each has a certain job to perform in the making of an automobile.

Wherever possible, the injured are always kept on the payroll. Naturally, a solderer with a broken arm encased in plaster is not capable of performing his regular operation, and his foreman is instructed to provide him with some other duty, such as sorting bolts or screws or running errands. Occasionally circumstances prevent the execution of this order and the man returns to work without permission. Violation of the rule subjects the injured to prolonged and costlier recovery or may result in permanent disability, or may endanger the lives of others, retard production, create imperfect workmanship, injure the reputation of the department or eventually force the patient on a furlough without pay or discharge from the payroll and entrance on the compensation list. Violators of our order are therefore threatened with discharge.

Common Difficulties

INFECTIONS are few, averaging about three daily. These usually can be traced to the carelessness or ignorance of the injured. It is physically impossible for us to give each of these cases, averaging 150 for the day shift and 90 for the night shift, two dressings daily or one at end of the day's work. Thus, with their dressings laden with dirt and grease, they remove them when washing up to go home and leave their wounds exposed until the following day or take a chance at dressing them themselves at home. Incidentally, when you instruct a patient either to soak or keep wet a dressing at home, you must make certain that he understands that he is not to add even salt to the water, otherwise he will soak his injury in strong solutions of lysol or other disinfectant and produce serious harm. And the minute you remove the old dressing and turn your back to deposit it in the soiled dressing receptacle, the patient will prod the injury with one of his dirty digits and run the risk of introducing infection. It is a hazard we must warn patients against continually.

We are only permitted to administer to the ill, medicines or drugs for temporary relief, advising the patient to consult his own physician for further treatment and advice. Those stricken with acute abdominal pains or other serious illness are despatched in our own car, one of us driving, to the hospital or home. None is permitted to leave work on account of illness without first submitting to an examination and being supplied with a written approval of his claim. Nor is anyone permitted to return to work after recovering from an illness until we examine and supply him with a medical "o.k." In order to absolve the company from blame in these cases, we compile a complete record for each one, for regardless of how insignificant either an industrial or non-industrial case may seem, there is always the possibility of it eventually reaching the workmen's compensation commission. Thus we accord these reports of outside illness or injury as much consideration as we do our other duties, avoiding all short cuts and lack of clarity. Careless reporting can result in a waste of time, and our surgeon and other officials and the insurance company's agents often have occasion to consult these records.

Nursing vs. Medical Duties

REGARDLESS of the emergency, we perform no suturing, incising or oher surgery. This is the duty of our surgeon, and in his absence we despatch those requiring it to the hospital. Lacerations and abrasions are the most numerous injuries. We use Dakin's solution for removing clotted blood, ether or amyl acetate (paint thinner) for scrubbing off the grime and grease, and either iodine, mercurochrome, or S. T. 37 as a sterilizer. The first dressing of all of these wounds is of Dakin's solution to prevent infection. When indicated, we use for subsequent dressings a compound of vaseline, zinc oxide and ammoniated mercury ointment. Because ointments have a tendency to produce eczema, we use them sparingly. We use coaptation splints whenever the moving of a joint is bound to retard healing.

We do all within our power to return the injured and sick to normal. Those who are confined to their homes with industrial injuries or illness are visited by our surgeon daily, and we never hesitate to despatch to a hospital those seriously injured or those requiring surgery (both of which are treated by the insurance company's staff of specialists). Our surgeon is on duty from 8:00 a.m. to 4:30 p.m. daily, reserving the time from 3:00 p.m. to 4:30 p.m. for the benefit of the night shift coming to work at 3:00. Mondays and Thursdays the insurance company's general surgeon, neurological and orthopedic surgeons and ophthalmologist conduct, with our own physician, clinics from 2:00 p.m. to 4:00 p.m., making it possible for the injured of both shifts to avail themselves of their services.

General Equipment

THOUGH limited and compact, our equipment and quarters are surprisingly efficient. We make and sterilize our own dressings and compound most of the ointments and solutions utilized on the premises. There is a private office for the surgeon adjoining our improvised operating room. We have two cots, a water sterilizer, two instrument sterilizers (one of which we use exclusively for boiling urine specimens, a dozen at a time) and medicine, instrument and dressings closets crammed with supplies, and there is one huge room in which we perform most of the dressings, treatments, examinations and clerical work.

Types of Injuries

PUNCTURE wounds, imbedded steel and wooden splinters and contusions rank next in number. Where possible, all puncture wounds are soaked in hot water, cleansed with ether (this always leaves a dry surface) and cauterized with carbolic 2% and done up in huge wet Dakin's dressings.

The victims of extensive wounds are given antitetanus and gas bacillus vaccine.

Unless a sliver may be removed easily, we do not dig into the wound with an instrument. We continue hot soaks in plain water applying wet dressings and, if it does not emerge within 24 hours, our surgeon extracts it surgically.

All severe contusions are subjected to x-ray, with the result that we frequently find longitudinal fractures, to which the surgeons administer. Ordinary contusions are treated by hot soaks, snug bandages (never adhesive strapping because of the dangers that might result from increased congestion), and the injured member is put at rest in a sling or on a crutch.

Compelled to perform their specific operations within the cramped quarters of car bodies, the upholsterers suffer strained backs, sprained

ankles and tenosynovitis of hands, wrists, forearms, fingers and feet. Tenosynovitis of the hand and forearm is treated with hot soaks and they are immobilized in splints fashioned to fit out of plaster of Paris bandages. We wall off with sheet wadding each finger or toe when wrapping two or more together either in splints or splintless dressings, so as not to produce an eczema.

Many of the body builders are subject to acid, solder, friction and acetylene torch burns. Those suffering acid burns of the eye become aware of the injury immediately and rush to the medical department. Here we flush out the eye with alkaline eye wash, remove with a sterile swab, solder or whatever foreign body may be present, apply cold compresses and either holocain and epinephrine 1% to relieve pain or mercurifom 1:3000 to prevent infection. Treated thus, these cases rarely ever become serious.

But this is not true of acid burns on other parts of the body, for the victims pay little attention to the sting or itching first noticed. Consequently we do not get these cases promptly and the burned area becomes gangrenous, black, punched out areas ranging from the size of peas to 25-cent pieces on arms, hands, legs and feet. These we soak in hot water for one hour and then dress with soda bicarbonate, warning the patient to keep the dressing wet at all times. These wet dressings are discontinued as soon as all slough or pus disappears and are replaced with a compound of vaseline, zinc oxide and ammoniated mercury ointment. Occasionally it is necessary to remove with forceps the gangrenous cap on these wounds. Our surgeon occasionally finds it necessary to aid recovery of these injuries with skin grafting.

All friction, solder and torch burns receive picricain ointment dressings at the time of injury to relieve the pain. This also is packed into the deep, bullet-like wounds caused by red hot welding rods. Subsequent dressings are of the ammoniated ointment compound. One must exercise perfect asepsis with these cases at all times to prevent infection, using sterile goods and instruments and medications only.

Because of the grime, grease and friction produced by contact with metal, all employees are subject to attacks of furuncles. These patients we subject to sunlight lamp treatments daily, dress their boils with either ergophene or icthyol, supply them with I. Q. & S., and advise them to eat at least three oranges daily and force fluids.

Lead poisoning, which is contracted through inhalation and digestion, is confined to the men engaged in buffing the solder applied to unions on the car bodies. These men perform their operation within an enclosure to prevent the fine solder dust from spreading over the factory and endangering the health of others, and each solder buffer is provided with a respirator. Monthly each body builder is summoned to the medical department and thoroughly examined for symptoms of lead poisoning or other diseases, and a record is kept on file. Whenever one shows the least sign of absorbing lead, or symptoms of other diseases, he is ordered a change of occupation and prescribed treatment accordingly. Whenever we contact the solder buffers we warn them about the necessity for washing their hands thoroughly before eating and to eat beyond the confines of their department. (Incidentally, for the general welfare of the plant, all the shifts are alternated weekly, and the men are urged to spend as much time in the open as possible.)

Regardless of the reason for visiting the medical department, even if it is just to get a few aspirin tablets to relieve a headache, the worker's number is reported on a daily medical chart, and a careful record kept in this way of his general condition.

Industrial Nurses—Who Are They?

FREQUENT inquiries come to the editors[1] regarding a list of experienced industrial nurses, qualifications of industrial nurses — salaries of industrial nurses, possible vacancies; requirements for employment in commercial and industrial establishments, etc. Many of these questions cannot be answered due to lack of available data. Unfortunately, few standards have been set up for the employment of nurses in industry. One can still find women functioning as nurses in industry who have no nursing training and are primarily attendants. There comes to mind the middle-aged woman who had once been a charwoman in a factory employing 400 machine workers. She won promotion over a period of years to the job of "welfare" worker, and also as plant nurse. When asked by one of the editors why she presumed to fill such a post without proper training, her frank reply was that she needed a job. In some establishments undergraduates are apt to be employed instead of fully-qualified women. It would be well for employers to be certan that the persons they plan to place in their plants as industrial nurses have the necessary minimum qualifications and experiences; also to get all credentials of those who pose as nurses, and to reject any who have not professional qualifications acceptable to State Boards of Nursing in particular states.

It is the responsibility of industrial nurses, on the other hand, to attempt to raise the level of their own standards and thus set others a potent example. One or more national organizations have already taken on some aspects of this task.

Employee Health at Sea

EMPLOYEE health measures[2] are a very necessary precaution for many reasons. Not only new employees pass a rigid examination before being accepted, but also every member of the crew is examined by the surgeons every voyage. These examinations are held in the crew dispensary a day or so before the end of the voyage so that, when we arrive at Quarantine, we can report any communicable disease (if any is present) to the health official. The entire crew sign off—that is, are released from the employ at the end of each voyage, signing on again a day or so before the ship sails for the next crossing—always provided each individual has a card showing he or she has passed the examination previously referred to. The card must bear the date of examination and must be initialed by the examining surgeon. If the doctor finds any defect in vision, teeth, chest, ears, throat, feet, etc., the person is given a permit for further treatment at the Marine Hospital. When the condition has been corrected, he reports back to our surgeon.

These precautions taken, and no cabin or tourist passenger on our medical list, there is nothing to worry about when we arrive off Quarantine.

I should mention the ship's hospital. It is on "C" deck, can be shut off from all other parts of the ship, has 12 beds in all: a ward of two beds for women passengers, same for men passengers, two beds in an isolation ward and six for the crew. All wards have their own bathrooms, a great boon for nursing purposes. There is an operating room efficiently and modernly equipped. (We do all our sterilizing on board.) There is also a dispensary for the crew. On "B" deck there is a dispensary, with waiting room and chief surgeon's office, which has been provided for the use of cabin and tourist passengers. These, plus instruments and a full line of medications, enable us to administer the "ounce of prevention" and, if necessary, the "pound of cure" as well.

Dermatitis from Enamels

TO THE EDITOR (J.A.M.A.)*: I should like to know whether you have any information regarding what chemicals are present in Cook's Baking Enamel that would produce a very severe dermatitis. I have a patient who has worked in the enameling department of a large corporation for the last 11 years without any trouble. The firm changed the kind of enamel it was using and in three or four days the patient had a severe dermatitis of the arms and feet. Any information you can give me regarding this will be appreciated.

—M.D., Kan.

ANSWER—The number of possible combinations of the many constituents in Cook's baking enamels aggregates a thousand. This does not mean that a thousand dissimilar chemicals enter these products but instead that the 25 or more constituents through quantitative variation may lead to a thousand different formulas. Among other constituents are toluene, xylene, petroleum distillates, (rarely) turpentine, glycerin, phthalic anhydride, butyl acetate and butyl alcohol. Almost any of these ingredients might lead to a dermatitis, particularly in persons with increased susceptibility to the action of chemical irritants. It is not possible to advise in this instance that a change be made to any particular type of enamels, since all contain similar ingredients and all are likely to lead to at least an occasional case of dermatitis.

1. Editorial in *Safety Engineering*, July, 1935.
2. From an article by ALICE M. ELLIS, R.N., S. S. Manhattan, U. S. Lines, in *Public Health Nursing*, August, 1935.

*J.A.M.A., July, 1935.

Code for Toxic Dusts, Gases and Fumes

MANUFACTURERS and employers who are faced with the occupational disease problem will be interested in the forward and important step being taken by the American Standards Association in preparing a safety code for toxic dusts, gases and fumes.

One of the outstanding purposes of the A. S. A., for which it is recognized both nationally and internationally has been the development of safety codes for industry. However, thus far the committee attempting to develop exhaust and ventilation codes has found it difficult to establish standards of performance without knowing the safe and unsafe atmospheric conditions for various contingencies for which they are drawing up standards.

To remove these difficulties, the Standards Council of the Association, on the recommendation of the Safety Code Correlating Committee, of which C. E. Pettibone, Vice President of American Mutual Liability Insurance Company and Manager of the Engineering Department, is chairman, on April 25 approved the appointment of a National Advisory Committee on Toxic Dusts and Gases. This committee will assist the various A. S. A. sectional committees in establishing threshold limits on toxic dusts, gases and fumes.

It is expected that among the qualified experts who will compose the Advisory Committee there will be specialists in toxicology, pathology and medicine. Men experienced in industrial medicine, medical research and insurance, and industrial chemists and engineers will be included.

At present there is no authoritative group as a source of limits on toxic gases and fumes, although some states have specified them and others are interested in them. The findings of such a group of specialists, experienced in all phases of the work as well as in modern research methods, and working together under the A. S. A., where industry is fully represented, are likely to form an authoritative opinion.

Chlorinated Hydrocarbons

IN ORDER to improve motor oils* there is an ever growing increase in the use of chlorinated solvents which remove some of the undesirable hydrocarbons thus producing a higher quality oil. Unfortunately the most efficient of the chlorinated hydrocarbon solvents are very toxic causing such physiological effects as headaches, nausea, nervousness, mental confusion, fatty degeneration of the liver, kidneys and heart with a subsequent necrosis, loss of consciousness, coma and death, depending on the concentration and length of exposure.

In order to prevent acute poisoning from chlorinated hydrocarbons the following requirements are recommended for strict observance:

I. Carefully select workmen and keep them under close medical supervision.

No employee should be assigned to this work until he has been examined by the Medical Department and found to be in excellent physical condition. Any employee complaining of or showing any symptoms of illness, especially dizziness, irritation of the eyes, respiratory or gastro-intestinal symptoms, should be required to report immediately to the plant physician. Periodical re-examination should be conducted and any employee who has signs or symptoms of poisoning should be removed from this work and assigned to work in the open air. Employees below par from any other reason should also be removed from the job until they are in good physical condition.

II. Conduct all operations in such a manner that the workers are protected from either inhaling the vapors or getting the solvent in their hands or clothing.

Where climatic conditions permit conduct all operations in so far as possible, out of doors. Enclose systems as far as practicable, and maintain proper inspection to detect and promptly repair any leaks or openings which might permit the escape of vapors. No open drain pipes should be allowed to open into trenches. Solvent from the distilling process should empty into a container located outside of the building. There should be a vent from the solution head tank extending outside and at least four feet above the roof.

Workers should not expose themselves to concentrations of chlorinated hydrocarbons high enough to cause coughing or irritations of the nose and throat; they should be warned to get out immediately from a room containing such concentrations, and should not go back without gas masks.

Workers are unusually susceptible to poisoning from chlorinated hydrocarbons if they have any alcohol in their systems.

Employees should be instructed whenever solvent comes in contact with the skin, to wash the affected portion immediately. Clothing wet with solvent should be removed at once and washed before being worn again, as continued exposure to chlorinated solvents will cause skin irritation.

III. Provide an approved full face piece, cannister type mask, for use in emergencies such as, line breaks, leaks, etc., and also when handling solvent, locating leaks, making repairs to pumps and cleaning tanks.

Care should be taken to see that mask is properly adjusted for the person who is to use it, also that the proper cannister is available. This cannister should contain activated charcoal and a hard form of soda lime to neutralize and withstand the acid vapors which result when chlorinated hydrocarbons are in contact with moisture. Masks and cannisters should be regularly inspected and maintained in perfect working condition.

An approved inhalator should be provided to be used in resuscitating persons overcome by solvent vapors. It has been found that the mixture of oxygen and carbon dioxide in the inhalators is especially valuable in overcoming the effects of breathing chlorinated hydrocarbons.

IV. Provide adequate ventilation.

Operations using chlorinated hydrocarbons should be carried on out in the open, in so far as possible. Where it is necessary that the work be done in buildings, provide openings in the bottom panels of walls so staggered or located as to permit a positive circulation of fresh air. All windows should be kept open.

Exhaust systems should have outlets near the floor and should be kept in operation until all the residual fumes are removed. Exhaust fans should be of sufficient capacity to provide at least 1½ complete air changes per minute.

V. Preparation for making repairs.

Whenever possible, before any unit is shut down for repairs, all parts should be thoroughly flushed with oil feed stock to insure that all traces of solvent or solution are washed out of the system before any of the equipment is opened or broken into. All lines connecting this unit should be properly blanked off from the rest of the system.

*From an Address by ROY S. BONSIB, Chief Safety Inspector, Standard Oil Company (New Jersey) entitled "Safeguarding Hazards Introduced by Improved Refinery Operations," presented at the Tenth Annual Meeting of the National Petroleum Association Fire and Safety Marshals, June 6, 1935; published in *Safety Engineering*, July, 1935.

—and Tetraethyl Lead

WITHIN the past few months most of the gasoline being produced and sold in the United States is treated with tethraethyl lead which greatly increases the efficiency of motor fuel and is necessary for the smooth operation of the later models of automobiles, nearly all of which have stepped up their compression ratios. Experience has shown that the careless and improper handling of ethyl fluid leads to very serious consequences but that no trouble whatsoever results when carefully following a few simple instructions.

Tetraethyl lead which is the principal constituent of ethyl fluid is an oily liquid which shows a decided tendency to creep through the seams or joints of containers and pipe lines, thereby supplying abundant opportunities for the danger of leakage. Moreover, it is a heavy material of almost twice the weight of water, so that packages of suitable size for the operation of mixing gasoline are handled with some difficulty, and with the ever present danger of physical injury to the worker, as well as the likelihood of bursting if dropped or subjected to unusual violence. Tetraethyl lead has an appreciable vapor pressure at ordinary temperatures, and if exposed to heat the vaporization of the fluid develops a pressure within containers, which under extreme conditions (conflagration) may result in the bursting of the container with ignition of its contents, and which in the hot sun's rays causes a sudden escape of vapor when the container is opened. Dr. R. A. Kehoe, Medical Director of the Ethyl Corporation, states that the oily (fat soluble) and somewhat volatile character of the material gives it a peculiarly hazardous quality among lead compounds in that absorption

takes place in the human body both by way of the unbroken skin through contact, and by way of the lungs through inhalation. He writes:

"The saturated vapor of tetraethyl lead in air at ordinary temperatures contains approximately 5 mgs. of lead per liter of air in a concentration which is lethal for experimental animals after a few hours exposure. It is apparent therefore that the rate of absorption of tetraethyl lead through the lungs is very much more rapid than in the case of particulate inorganic lead compounds, and that the dangers of inhalation are correspondingly great."

According to Dr. Kehoe the various factors which influence the magnitude of occupational hazards of the workmen handling and mixing ethyl fluid may be listed in order of their importance as follows:

"(1) The extent of the cooperation of refinery management in the avoidance of irregular practices such as unnecessary sampling of fluid, the removal of small amounts of fluid into intermediate containers for experimental mixes, and for the correction of errors in mixing—in short, the avoidance of any handling of fluid except by means of the standard mixing equipment.

"(2) The quality of the mixing equipment;

"(3) The frequency of mixing (this depends largely upon the adequacy of storage facilities for ethyl gasoline in relation to the volume of ethyl gasoline distribution); and,

"(4) The degree of caution exercised by the mixing personnel in following the instructions as prescribed. The importance of the last item is stressed at all times in the promotion of safety, but much greater dependency is put in the automatic safety which is afforded by the installation of proper mixing equipment and adequate storage facilities.

"It is manifestly impossible to prevent departures from accepted and safe procedures excepting as the refinery management and personnel give their willing and intelligent cooperation toward the promotion of safety, and unless they accept in practice, the point of view that no commercial consideration can justify is reasonably resigned to promote the violation of a regulation which safety. The importance of the development and maintenance of this point of view toward the handling of ethyl fluid cannot be over-emphasized, for therein is the most significant problem of safety."

Workmen's Compensation

History of Workmen's Compensation for Occupational Diseases

THE principle of the workmen's compensation law* is that industry should share the loss from "personal injuries" to employees caused by "trade risks". But the earlier compensation laws (with exception of the Swiss law explained below) were all restricted to cover only occupational accidents—"accident" being construed to mean an unexpected and fortuitous event, happening more or less suddenly—to the exclusion of injuries to health incurred or suffered gradually or resulting from customary acts or exposures. But, later, at various dates, there have been added to a considerable number of those accident compensation laws special provisions for compensation for some diseases not resulting from accidents—in Great Britain called "industrial" but in America called "occupational" diseases.

FOREIGN precedents: Switzerland, in 1877, in a primitive form of compensation law, led the way in imposing upon employers responsibility for such diseases as are specific to the use in industry of poisons or harmful substances in cases where the disease is conclusively proved to have been caused by the occupation under the employer to be held liable. In later developments of this Swiss law, the poisons and harmful substances were required to be listed by the Federal Council; and the list has been gradually enlarged until now it includes some 88 items; and the provisions defining the conditions to responsibility have been modified in details but still adhere closely to the original purpose and effect.

In Germany, at an early date, there was inserted in the "Accident Insurance Law" a provision empowering the Federal Council to extend that law to provide compensation for such occupational diseases as such Council should specify and to make special regulations relative thereto. But for years the Council remained unconvinced of the wisdom of exercising such power, and it was not until July, 1925, that the Minister of Labor, succeeding to the power of the Federal Council, issued an order making compensable, as if accidents, several specified miners' diseases and diseases caused by lead or any of a number of other substances or by radioactive rays.

In the meantime, in 1906, Great Britain, in a revision of its original workmen's compensation law of 1897, was the first country to follow the example of Switzerland, by including in the revised law special provisions for compensation for certain diseases listed in a schedule (there called "industrial diseases") as if "injuries by accident". This law laid down as a condition to the right to compensation that, to be compensable, the disease must be due to the "nature" of the employment; but certain processes were named opposite to each disease in the schedule; and if immediately before the date of his disablement the workman was employed in a process so named opposite to his disease, the disease was rebuttably to be presumed to be due to the nature of his employment. And the Secretary of State was empowered to add new diseases to the schedule. Since such enactment of 1906, the British schedule of occupational diseases has been enlarged by frequent additions; but the form and substance of the law has been little modified, except by the further addition of special provisions relative to compensation for silicosis and asbestosis[1].

Following the example of Great Britain nearly all the accident compensation laws of European countries and of the British Dominions have since been extended to cover some diseases not resulting from accidents; but in every case (with exception of the law of New South Wales) the diseases covered are listed in a schedule, defined to be diseases specific to poisons or harmful substances listed in a schedule, or in some other way all distinctly specified. And, quite generally, in these laws, special provisions, differing from those applicable to accidents, regulate the terms and conditions subject to which the diseases specified shall be compensable.

The compensation laws of South America are all of comparatively recent date. Of them, according to the latest information available:— The laws of Colombia and Peru yet cover only "injuries by accident", whereas the laws of Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, Uruguay and Venezuela now cover also "occupational diseases." In Chili, Ecuador, Uruguay and Venezuela, "occupational diseases" are defined to mean only those which are "scheduled". In Argentina, Bolivia and Paraguay "occupational diseases" are defined to mean only those diseases due "exclusively" to the nature of the employment. In Brazil they mean only those diseases listed in a schedule or "contracted exclusively in the course of the employment and due to the nature thereof."

The laws of the various Central American and Mexican States and Cuba are too choatic to repay analysis and are of negligible weight as precedents. The law of Japan is in a transitory stage and not reliably reported.

None of the earlier schedules of occupational diseases in the European laws included silicosis or kindred diseases of the lungs, although what we now call silicosis was early recognized in South Africa to be a serious occupational affliction. Finally, in 1918, Great Britain added "fibroid phthisis or silicosis of the lungs" to its schedule, subject to special regulations. That original provision has since been replaced by four special schemes for compensation for silicosis (including silicosis complicated with tuberculosis) and one such scheme for asbestosis, in certain groups of industries. Germany added silicosis—"serious pneumoconiosis"—to its schedule in 1929. And, now, various dust diseases of the lungs, specifically named, with silicosis the most prominent, when occurring in specified occupations or under specified conditions, are compensable, either under general com-

* P. TECUMSEH SHERMAN, in Bulletin of the Association of Casualty and Surety Executives, June, 1935.

1. At one time the schedule of occupational diseases in Quebec law included silicosis; but that item was quickly deleted by amendment.

pensation laws or under special schemes or statues, nearly always subject to special regulations and safeguards, in the following countries and Dominions of Great Britain:—Bulgaria, Czechoslovakia, Denmark, Germany, Great Britain, Sweden, Switzerland, Russia, South Africa, Australia (Federal), New South Wales, Queensland, South Australia, Tasmania, Western Australia, New Zealand, Alberta, Ontario, Saskatchewan, Argentina, Bolivia, Brazil, Chile and Mexico (Federal). It is noted that under some of the special statutes above referred to the state contributes to the cost.

LAWS of the United States: In contrast with the foreign precedents, the provisions of our compensation laws relative to coverage of occupational diseases have developed chaotically and, generally, with wanton disregard of experience.

The following is a summary of such provisions in our laws as are now in effect or enacted and soon to take effect. Besides accidents and diseases resulting from accidents:

The compensation laws of Minnesota, New Jersey, North Carolina, Ohio and Puerto Rico cover certain scheduled diseases, termed "occupational"—the North Carolina schedule alone covering silicosis and asbestosis, subject to special conditions.

The New York law covers certain scheduled diseases where due to employment in specified processes, and (by amendment to take effect September 1, 1935) also any and all "occupational diseases", undefined, due to the nature of the employment in any of the "hazardous" industries —which, in New York, are defined to include almost all industries.

In Illinois, by separate act, some few occupational diseases, ambiguously defined, are compensable.

Under the West Virginia law silicosis is compensable, subject to special conditions.

In Kentucky, silicosis in certain industries may be brought under compensation by special election; and diseases due to inhalation of gases are generally compensable.

The Connecticut law covers "occupational diseases", defined to mean only diseases "peculiar" to occupations and "due to causes in excess of the ordinary hazards of employment as such".

The law of the District of Columbia and the Longshoresmen's Act cover "occupational diseases", undefined.

The Missouri law provides that "occupational diseases", undefined, may be brought under compensation by special election.

The Wisconsin law covers "mental or physical harm" caused by "accident or disease", "sustained in performing service growing out of and incidental to" the employment.

The laws of Hawaii and the Philippine Islands cover any disease "proximately" or "directly" caused by the employment or its nature.

The laws of California, Iowa and Massachusetts cover all "injuries" arising out of and in the course of the employment.

The North Dakota law literally covers any disease proximately caused by the employment but is administered to exclude diseases not resulting from accidents.

The laws of Texas and Wyoming are ambiguous but have been construed to cover only accidents. All the other compensation laws exclude diseases except where resulting from accidents.

Under the laws just reviewed, reported experience with occupational disease coverage, long enough to be of any significance, is yet limited to a few states; and experience with compensation for silicosis has been even more limited and everywhere brief. No occupational disease experience whatsoever, so far as can be learned, is reported from Hawaii or the Philippine Islands.

The laws of the District of Columbia and the Longshoresmen's Act cover only employments in which recognized occupational diseases are almost unknown, and no reported cases have yet arisen to indicate how the provisions of such laws relative to occupational diseases will eventually be construed and applied.

The Illinois law, because of its ambiguities, has been principally a source of litigation and uncertainties, and experience thereunder is merely confusing. In Missouri the provision for compensation coverage of occupational diseases was not enacted until 1931 and is optional, with the consequence that experience with the more serious occupational diseases is still principally under the alternative "common law" liability for the negligence.

The provisions relative to occupational diseases in Kentucky have been added in the last few years; and in the laws of North Carolina and West Virginia have been added by amendments of 1935.

The Iowa compensation law was construed to cover only accidental injuries until 1934, when the Supreme Court of the State construed it to have a broader coverage.[2]

There has been fairly long experience under "schedules" in Minnesota, New Jersey, New York and Ohio—enough to demonstrate that the "schedule plan" operates almost automatically, giving rise to a minimum of litigation, and to support the opinion prevalent abroad, that the proper way to cover occupational diseases in a compensation law is through the progressive development of a schedule.

But under none of our schedules has there yet been experience with compensation for silicosis or other dust diseases of the lungs—which, foreign experience indicates, calls for special terms and conditions to safeguard against impositions. On the other hand, the laws of Connecticut, Massachusetts, California and Wisconsin have, nominally, long covered silicosis; but in each of these states the law has had a peculiar history, of sufficient significance to be noted in some detail.

In Connecticut, the original compensation law covered only injuries that happened at a definite time and place—i. e. by accident. In 1919 the law was amended to abrogate that limitation and was then construed by the courts to cover all physical ill effects of working, whether resulting suddenly or gradually and whether caused or only contributed to by usual, expected or unexpected, healthy or unhealthy incidents or conditions of employment, including the results of aggravations of ill health due to predisposition, pre-existing diseases, vices and bad habits or bad living conditions. The result was to stretch the compensation law far into the fields of ordinary health, invalidity and life insurance, to induce an intolerable flood of claims and to lead to a radical reaction. In 1927 the law was amended to cover only "accidental injuries" and "occupational diseases", with the latter term defined as hereinbefore stated; to exclude all injuries unless due to employment "otherwise than through weakened resistance or lowered vitality"; and to reduce the compensation benefits in cases of aggravation of pre-existing diseases. As so amended, the Connecticut law has since been operating quite smoothly to cover a wide range of diseases generally recognized to be "occupational", including silicosis; but the limits to its coverage and the conditions to the right to compensation under it are not yet exactly defined and remain subjects for litigation and uncertainty.

In Massachusetts, the compensation law, since its original enactment in 1912, has nominally covered all "personal injuries" arising out of and in the course of the employment; but the meaning and content of the term "personal injuries" has been a subject for uncertainty and continual litigation, and it was not until 1929, after 17 years of litigation, that it was definitely decided[3] that disablement from inhalation of silica dust is a compensable injury. Still claims for compensation for silicosis continued to be rare, until "claim consciousness" was aroused in 1933 by publicity given to the dismissal of some 42 employees from a foundry at Taunton, because reported, upon medical examination, to manifest incipient symptoms of silicosis or tuberculosis. Since then conditions in Massachusetts have been chaotic, to the distress of all parties concerned. Many employers are having difficulty in obtaining insurance because unable or unwilling to pay the price demanded by insurance carriers for silicosis coverage, whereas the insurance carriers are reluctant to provide such coverage at manual rates, in view of the probability of their proving to be extremely inadequate. Measures to amend the Massachusetts law by the adoption of special regulations clarifying the conditions to the liability for compensation for silicosis, as is the practice abroad, have been under consideration; but, as yet, nothing has been done.

In California the workmen's compensation law, since 1918, has covered "any injury", including a disease, arising out of and in the course of the employment. During the earlier years under this law, silicosis was popularly unknown; and, by the time it began to be known, old cases were barred by the fact that the law was then construed to re-

2 *Almquist v. Shenandoah Nurseries*, 254 N.W. 35.

3. *Sullivan's Case*, 265 Mass. 497.
4. *Spicky Polish Corp. Cases*, 18 Pac. (2d) 933.

quire that a claim for compensation for an occupational disease must be made within six months after the first manifestations of symptoms of the disease. Then, in 1930, the construction was liberalized to permit of claim within six months after disablement. And, finally, in 1933, the Supreme Court[4] still further liberalized the construction by ruling that in case of a progressive disease, such as silicosis, a claim is timely if made within six months from the date when the employee first learned, or reasonably should have known, that his disablity was due to such disease. That decision, with its sweeping implications, has stirred up a lively and widespread appreciation of the possibilities of gain through claims for disability and death from ill health attributed as an afterthought to exposures in employment. Consequently it is approximately correct to say that experience with compensation for silicosis in particular and other progressive "occupational diseases" in general, is only about beginning in California.

In Wisconsin, the workmen's compensation law covered only "accidental injuries" or "injuries by accident" until in 1919 when it was amended to cover also "occupational diseases". In 1931 it was again amended to cover any "mental or physical harm", caused by "accident or disease", "sustained in performing service growing out of and incidental to" the employment. But, until July 1, 1933, an occupational disease was not compensable under the Wisconsin law, unless disablement resulted therefrom "in the course of the employment".[5] Then, by amendment, all definite limits upon the time within which disablement must result from the contraction of the disease were removed. Notwithstanding the amendment of 1919, above cited, claims for silocisis were almost negligible in Wisconsin until, in 1931, unemployment became widespread and a rising flood of claims resulted. With data available for losses under policies expiring in 1933, there is now some three years experience to indicate the results of the Wisconsin law in application to compensation for silicosis. And such experience is alarming. It indicates a loss cost for compensation for silicosis, in some industries amounting to many times the accident cost—to as much at $24 per $100 of wages in one industry. But it is doubtful how far such excessive cost is a temporary phenomenon, due to be abated under changing conditions. On the other hand, however, the effect of the amendment of 1933 in opening wide the door to impositions incident to the admission of stale claims is still to be tested by experience.

TO SUMMARIZE the experience just reviewed: Except under those of our compensation laws which have covered only long recognized occupational diseases, specifically described in a "schedule" or otherwise, the experience has been sufficient only to hold out a warning that, as evidenced by the experience in Massachusetts and Connecticut, coverage of occupational diseases, without defining them, creates a condition of uncertainty, fraught with wasteful litigation—which it is a primary purpose of the compensation law to avoid—and is apt to result, as it did in Connecticut, in an extension of the compensation law so far beyond its principles and legitimate purposes as to become intolerable; and that, as evidenced by Massachusetts and Wisconsin experience, coverage of such progressive and difficultly diagnosable diseases as silicosis, without special safeguards and limitations, imposes upon industry a liability so uncertain, costly and subject to perversions, as to imperil the very existence of the industries affected and the welfare of those dependent upon them for employment.

In the rapid advances that are now being made in the way of adding occupational disease coverage to our workmen's compensation laws and of "liberalizing" such coverage where it is already provided, there is a strong trend in the direction of converting such laws into measures partaking largely of the nature of ordinary invalidity and life insurance for wageworkers. Before we commit ourselves too far in that direction we should pause and carefully consider the consequences. The true welfare of the wageworkers is not served by ill-considered and impracticable perversions of the principle of workmen's compensation. A regular wage is their prime desideratum; and a rule of compensation which would spell widespread ruin for industry unless it weeds out the ailing and the aging from among its workers would be more of a curse than a blessing. Industry can and should compensate liberally for the losses in earning capacity resulting from those diseases which are distinctly caused by special peculiar industrial processes or occupations; but

[4] *Kimlark Rug Corp.* v. *Stansfield*, 246 N.W. 424.

THE BULLETIN

of

The American Association of Industrial Physicians and Surgeons

THE object of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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it is beyond the limits of practicability for industry to insure its employees indiscriminately against loss of full earning capacity due to the ordinary diseases or infirmities of life wherever it can be made out that such illnesses have been aggravated or accelerated by ordinary incidents or conditions of work. Relief of those workmen who suffer from ordinary illnesses of life must be provided for in some other way. We are erring dangerously in our tendency to ignore the line of demarcation between compensation for those injuries to health for which particular industries can rightly be held responsible, and measures for the protection, relief or insurance of the working people against the common misfortunes of life, which, in the well established foreign precedents, is clearly drawn.

Fractures Involving the Elbow

IN CONSIDERING fractures involving the elbow* the treatment must be directed with a view to re-establishing or maintaining the carrying angle of the arm as much as possible. Next in importance is the arc center of flexion and extension. If one will remember that the elbow more nearly approaches the true hinge than any other joint in the body it will aid him immensely in the treatment of fractures in this region. Nature is often very kind to us in the treatment of these frequently complicated injuries, but nevertheless a mechanical re-establishment of the joint is almost imperative if we expect to get a normally functioning elbow out of what Cotton often refers to as "a mess."

Fractures involving the elbow include all of the various types of supra-condylar and diacondylar, whether they involve the articular surface or not, fractures of the olecranon, the coronoid and the upper third of the shaft of the ulna, and all fractures of the head as well as of the upper third of the radius.

The mechanics of these injuries are produced, usually from one of three sources; namely, extreme sudden forced hyperextension of the elbow, by falls striking the olecranon and by direct violence to any point about the elbow. Falling backward with the palm of the hand so placed as to prevent the fall as much as possible is occasionally the cause of a supra-condylar fracture or fracture of the olecranon. In man, as in all other animals whose humerus accounts for half or more than half the length of the entire arm, the elbow is an exceedingly fragile joint, whereas in other animals, quadrupeds who walk upon their toes, the elbow is well protected by the trunk and rarely used in full extension. In quadrupeds also the humerus is much shorter and stronger than in man and therefore offers considerably less opportunity for injury. However, the fragility of the bony structure is compensated by the marvelous ligamentous structure. Moreover, the various extensor and flexor tendons frequently prevent bone injury from direct violence.

In effect the elbow joint is composed of two separate joints. A main hinge-like joint between the humerus and the head of the radius and the great sigmoid of the ulna below; and a smaller joint between the border of the head of the radius and the lesser sigmoid of the ulna, which permits rotation of the head of the radius in the obicular ligament. There are two distinct arcs in the hinge-like movement of the elbow, one for the greater sigmoid of the ulna and one for the head of the radius. Normally the center of these arcs is identical. This explains why T- or Y-fractures of the lower end of the humerus often destroy the carrying angle and limit extension and flexion. In other words, the reduction is not complete as long as the arcs are in eccentric.

Fractures of the Lower End of the Humerus

THESE comprise the following types of fractures and epiphyseal separation:

1. Supra-condylar fracture.
2. Transverse diacondylar fracture.
3. Fracture of a single condyle.
4. Intercondyloid or T-fracture.
5. Fracture of an epicondyle.
6. Separation of an epiphysis.

Supra-condylar Fracture

THIS injury is common in children and is usually produced by a fall on the out-stretched hand with the elbow hyperextended. The olecranon is locked in its fossa and leverage is exerted on the lower end of the humerus. The line of fracture does not usually enter the joint. Almost invariably the lower fragment is displaced backward because of the action of the original fracturing force and the effect of the strong pull of the triceps.

The deformity in the usual supra-condylar fracture is characteristic, though it can be confused with the posterier dislocation of the elbow. However, the entire elbow is displaced backwards in the case of fracture, whereas in the case of dislocation it is the olecranon alone whose position is changed.

Transverse Diacondylar Fracture

THIS injury resembles the preceding one so closely that it is often very hard to distinguish between them without x-ray study. In diacondylar fractures, however, the fracture line passes through the condyles instead of above them. The fact that it always directly involves the articular surfaces of the joint makes it sufficiently important to deserve special mention. Healing of this fracture will be more likely to limit the normal range of flexion and extension because of callus formation encroaching upon the coronoid or olecranon fossae or both. The mechanism is usually a fall on the extensor surface of the forearm.

Fracture of a Single Condyle

THE lateral condyle is fractured singly much more frequently than the mesial condyle. The mechanics vary but are usually either a fall on the out-stretched arm, in which the radius is driven upward against the capitellum, or a direct blow from a fall on the outer portion of the elbow. Fractures of the mesial condyle may result from a fall on the flexed elbow, the force being transmitted to the humerus by the ulna. In both types of injury the fracture line usually begins in the trochlea and then passes obliquely upward to either the outer or inner side, depending upon which condyle receives the force. The affected condyle is usually displaced upward and forward. Unless properly reduced the joint axis is completely changed and consequently impairment of function and change in the carrying angle results. The deformity produced is a complete change in the joint axis. The carrying angle is completely gone and the position of the epicondyle on the affected side is altered in relationship to its fellow and the tip of the olecranon. This is also true in fractures of an epicondyle but in the latter case it is often possible to move the bony prominence and recognize by palpation the extent of the injury.

Intercondyloid, "T" or "Y" Fractures

THIS is essentially an adult injury and is of infrequent occurance in comparison with other fractures of the lower end of the humerus. It may be produced by a fall on the point of the elbow, the ulna being driven upward into the trochlea, as a wedge, or it may occur secondarily as a result of the splintering effect of the shaft upon the condyle. Often it is accompanied by considerable comminution. This injury threatens complete loss of function.

Separation of an Epiphysis

IN EPIPHYSEAL separation it may be possible to palpate the displaced portion of the cartilage as a rounded prominence lying to the outer side of the olecranon on the posterior surface of the elbow. If this is masked by swelling the diagnosis then chiefly depends upon clinical findings suggestive of severe injury such as marked tenderness and limitation of motion. X-rays usually show little evidence of damage. It is important to remember in this connection that the bony center for the capitellar epiphysis lies in a forward position, so that the line of the anterior surface of the shaft of the humerus, if projected downward, normally bisects it. If this is not remembered it is easy to overlook slight posterior displacement.

Treatment

THE general principles of treatment of fractures of the lower end of the humerus are essentially the same. The fractures produce probably a greater percentage of disabilities than any other of the common fractures, in spite of the fact that they occur most frequently in children, in which class of patients best results are to be expected.

As pointed out by Smith, Thomas and Jones the treatment should be based on anatomic and physiological principles. The structures about the elbow must be utilized as aids in securing and maintaining alignment. Joint function must be preserved by

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VAL PARMLEY, M.D., F.A.C.S., Little Rock, Ark.; read before the Sixtieth Annual Session of the Arkansas Medical Society, Fort Smith, April 16, 1935; published in *J. Arkansas Med. Soc.* August, 1935.

early movement and in the position whence the greatest usefulness will result if complete recovery is not obtained. The plan of treatment comprises three separate steps. First, the reduction of the deformity; second, immobilization with the elbow in the position of acute flexion, and; third, early inauguration of partial active movements of the elbow.

No attempt should be made to reduce any type of fracture of the lower end of the humerus, or for that matter about the elbow, except when the patient is under full ether anesthesia. The elbow should be placed in complete extension, manipulation of the fragments into position and then complete flexion to maintain them in proper position, is the procedure to follow in the instance of practically all fractures in the lower end of the humerus. In fractures of the epicondyle the joint is usually not disturbed.

It is important to observe three points in determining, at the time of reduction, whether complete replacement has or has not been obtained. First, the arm should be compared with the uninjured side, particularly with reference to the carrying angle, when the elbow is extended. Second, the limitation of motion, if any, when the elbow is completely flexed; and, third, in the latter position the radial pulse should be palpated to determine if there is compression of the brachial artery.

In accomplishing immobilization one should guard against placing a roll of gauze or any bulky material in the bend of the elbow. Three or four layers of gauze is all that is necessary to prevent skin irritation.

The reasons for immobilization in complete flexion are as follows: First, it splints the bones and holds them in a reduced position better than any other method, using the broad tendon of the triceps stretched taut across the elbow behind as a natural splint. Second, it places the elbow in the position whence function is most quickly and easily recovered. Third, it places the arm in the position of optimum function if stiffness or limitation of motion result.

Various methods of holding the elbow in the flexed position are available and the choice may be made of them according to the type of fracture and to what extent complete immobilization is desired. In all cases it is desirable to compress the elbow to prevent swelling. However, the method of encircling the arm and forearm with a cuff of adhesive plaster is to be condemned because of resulting circulatory interference and congestion at the elbow. The simple method of bandaging the elbow and the forearm to the arm with a sling around the neck to support the wrist and hand is all that is necessary in most cases. In some of the more severe types, when absolute immobilization is desired, a posterior molded plaster splint extending from the fingers to the shoulder may be applied over proper padding. After the application of the dressing, tests should be made for circulatory disturbances. My rule is to see the patient within a few hours following the dressing to make certain of this point. At the end of three or four days the dressing should be opened and the skin over the front of the elbow inspected and powdered. If blebs are present they should be punctured and covered with sterile gauze.

Of importance fully equal to that of the immediate treatment is the matter of after treatment; when to begin and how. Too long immobilization premits the reparative processes in the region of the injury to bind down in scar tissue the joint capsule and neighboring muscles and tendons. On the other hand, too early or too vigorous motion strains the callus, detaches the periosteum and small bony fragments, and leads, by constant irritation, either to overgrowth of callus or the formation of bony masses in the muscles. In children I usually remove the dressing at the end of the first week and give the child a few degrees of passive motion for several minutes, repeating this procedure every three or four days. At the end of the third week the dressing is removed and the child is allowed to produce active motion in the joint for a few minutes. This is repeated every third of fourth day for from one to two weeks when the dressing is removed and active motion is insisted upon, though the mother is instructed to keep the arm in a sling while the child is playing with other children. A little later the mother is instructed to have the child carry a small bucket of sand and, as often as possible, adding a little more sand each day until extension is complete.

In adults the procedure is somewhat different. The dressing is opened to observe if maceration of the skin is present at the end of the third or fourth day, but immobilization is not released until the beginning of the third week when the same procedure as used with the child is begun and carried out.

Fracture of the Head of the Radius

THIS injury occurs almost entirely in adults, is usually the result of severe trauma, and is frequently associated with other fractures of the elbow. It may result from the force applied to the hand and transmitted upward, the elbow being slightly flexed. In this mechanism the radius is thrust against the capitellum resulting in the splintering of the head. Occasionally it results from direct violence. The neck of the radius may be fractured and the head dislocated forward or there may be impaction without displacement. Occasionally small fragments may be chipped from the head without accompanying fracture of the neck. However, the usual thing is to find comminution of the head associated with fracture of the neck with considerable displacement of the fragments. It is sometimes associated with dislocation at the elbow.

From the standpoint of treatment these cases must be divided into two classes; those with displacement and those without displacement. The latter class presents no special problem. The elbow should be flexed acutely, the forearm supinated, anesthesia being unnecessary. Immobilization by means of the hyperflexed bandage is probably the best method to employ. Light passive movements should be begun early and use should be encouraged at the end of from two to three weeks.

Fracture with displacement is of a great deal more concern to the surgeon. If the displacement is not great the above described method probably offers the best solution. With extensive comminution of the head also the closed method is probably best. However, any wandering fragments should be removed at an early date because of extensive callus formation and bone development which, if allowed to take place, will certainly result in impairment of motion. If there is a marked displacement then excision of the radial head through an incision directly over the posterier aspect is indicated.

Fracture of the Coronoid Process

THIS injury rarely occurs alone and is almost commonly associated with posterior dislocation of the elbow since the coronoid process constitutes a check to posterior displacement of the ulna. The tendon of the brachialis anticus muscle is inserted into the coronoid process. Therefore considerable displacement upward may be expected when the elbow is extended. The treatment depends upon acute flexion and thorough immobilization. In these instances movement should not be allowed for from three to four weeks.

Fracture of the Olecranon

THIS injury may result at any age but is most common in adults. Occasionally it is compounded because of direct violence to the elbow, as often occurs in falls on hard surfaces striking the elbow first. More frequently it is the result of a combination of muscular action and indirect violence, as in the case of a fall on the out-stretched and semi-flexed arm. The effect of the blow thus produced causes flexion of the elbow against muscular resistance and the olecranon, being the weak point, gives way.

Usually the fracture line is transverse and penetrates directly into the greater sigmoid cavity. Comminution is very rare. There is effusion of the elbow joint and usually a large soft swelling of the seat of injury.

Many methods have been attempted to obviate open reduction with the elbow in complete extension. Usually these methods fail and unless good approximation can be obtained open reduction is indicated. In compound fractures it is always indicated since the dangers of an open reduction already exist. If approximation is not accomplished a soft fibrous type of union will form, thus lengthening the olecranon and interfering with proper function.

If the patient is young and healthy and the time element is important it is better to do an open reduction early in order that he may return to his work as soon as possible. Immobilization is best accomplished in the extended position by the use of an enveloping plaster cast extending from the arm-pit to the fingers.

Volkmann's ischaemic contracture is probably the most common disability arising from these fractures.

Involvement of the ulnar or median nerve, of course, will produce paralysis. Often a disability results in the loss of the carrying angle. Limitation of motion and complete ankylosis may result from excessive new bone formation or immobilization for too long a time.

Discussion

W. V. NEWMAN, Little Rock: Dr. Parmley's excellent paper on fractures about the elbow brings to mind a few points concerning these fractures which I would like to emphasize. Immediate examination of the part for nerve and blood vessels damage is of great importance, not only from a diagnostic standpoint but as a guide to treatment, and that one may inform the patient that such damage has occurred thereby stalking any ideas they might have for a malpractice suit at a future date. Early immediate reduction, if possible, before swelling has advanced, is necessary if the best results are to be obtained. Concerning the Jones position or acute flexion of the elbow, I have not found it necessary to use such acute flexion as demonstrated in the slide, to maintain position of the fragments. About 110° flexion has been sufficient. Early motion is imperative, and two week's time, with but few exceptions, should be the maximum limit before motion is started. At first, assistive active motion, has been my method of choice followed within a week or two by strictly active motion. I prefer active motion because if the patient is allowed to carry out the motion there is less likelihood that the position of the fragments will be disturbed and secondly 10 times as much benefit is obtained by active as by passive motion.

ROBERT A. MILLIKEN, Little Rock: Dr. Parmley touched on one complication of elbow fractures that I feel needs elaboration, Volkmann's contracture. That this is not a rare complication is shown by the fact that I have had four cases to deal with in the last three months. Volkmann's contracture is a hyperaemia (rather than an anemia) caused by the fact that the tight antecubital fascia acts as a tourniquet under the influence of hemorrage and edema to the extent of allowing arterial inflow and impeding venous outflow. If this is allowed to continue more than a few hours a fibrous degeneration of the striped muscle fiber of the flexor muscles takes place with the familiar shortening, loss of elasticity and claw-hand deformity resulting. It was the older idea that Volkmann's contracture necessarily resulted from carelessness in the application of tight bandages or splintage and, while it is a healthy attitude for us to suspect that complications are the result of our own actions, injustice has often been done by this philosophy. I have seen Volkmann's contracture develop in a case which, because of more serious complications, was allowed to rest in bed with the elbow completely untreated. I do not wish to go into the treatment of this condition because it is too much a matter of technical detail for a brief discussion, but I would like to record my belief that Volkmann's contracture can be prevented in any suspicious case by bold incision of the antecubital fascia. No case in which I have performed this maneuvre has developed Volkmann's contracture.

VAL PARMLEY, closing:
The discussion seems to center about the complications of Volkmann's contracture and nerve injuries. These complications are not common by any manner of means, something less than 2% of all fractures involving the elbow joint. Dr. Milliken gave us a very clear picture of Volkmann's contracture in his brief discussion, and I thoroughly agree with him in the method he described as a possible preventive of this serious complication.

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Effects of Breathing Dusts with Special Reference to Silicosis

—Review of the Literature—

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LAST month* we published part of Section 1 of "U. S. Bureau of Mines Information Circular 6840," ending with the subtitle, "Properties of sericite." The remainder of Section 1 follows:

CARBON DIOXIDE THEORY: An article in the **Canadian Mining Journal** for September, 1934, called attention to the interesting theories and facts brought out in the discussion of Dr. Jones' paper on sericite as a cause of silicosis. Edge's[20-a] theory is based on the liquid inclusions in quarts and other minerals, a fact known to petrologists for many years but one that has received little attention. Edge examined carefully specimens of quartz from mining districts where silicosis is prevalent and found that the quartz of these regions carries liquid inclusions, while that of areas free from silicosis carries very little; he therefore suggests that this fact may have some bearing upon the disease. The journal discusses the matter as follows:

"The remarks of Mr. Edge on milky quartz from the Hollinger are of more than ordinary interest. He points out that, as expected, the microscope revealed that the whiteness of quartz was due to the reflection of light from immense numbers of minute cavities, each containing liquid and a gas bubble. In the Hollinger quartz he found that the number of visible cavities per cubic millimeter was of the order of 1,000,000, being seldom less than 200,000, and rarely more than 3,000,000.

"He goes on to say 'many of the cavities were found to contain two immiscible liquids as well as a gas bubble, the latter incidentally being kept in a perpetual state of agitation by the Brownian movement of the gas molecules within it. Of the two liquids, one was easily identified as liquid carbon dioxide by means of its critical temperature (31° C.). The other liquid appeared to be water or an aqueous solution of some kind.'

"Naturally, with the presence of liquid carbon dioxide established, it was easy for the investigator to deduce the pressure existing in these cavities for any particular temperature. Thus, if a piece of this quartz was placed in the mouth for a few moments its temperature would be raised to that of the body (37° C.), which is 6° above the critical temperature of CO_2.

"It follows, therefore, that, with the quartz subject to body temperature, all the contained CO_2 would be in the gas phase, and by referring to tables of physical data, it immediately becomes obvious that the pressure within the cavities is in the vicinity of 84 atmospheres, which is more than half a ton to the square inch. Mr. Edge points out that 'furthermore, if the pressure were suddenly released, say by the solution and ultimate bursting of the walls of the cavity, the compressed CO_2 would expand almost instantaneously to about 400 times the volume which it occupied within the cavity. In fact, some of the quartz specimens examined contained between three and four times their own volume of CO_2 if the latter were released to conditions of normal temperature and pressure.'

"Mr. Edge found similar conditions in the quartz of the Rand. As he points out, quartz particles taken into the human lung can contain a great number of these cavities, and there is some interesting food for thought in speculating upon exactly what happens if these particles are disintegrated and discharge their gases under pressure into the surrounding tissue. Mr. Edge does not advance these possibilities very far; but his work on the liquid inclusion of milky quartz is very interesting and may present another field of investigation."

Irwin[21] reports the following results of investigations carried out at the Banting Institute (Toronto):

"Since little or no silicosis was observed in workers on the crushers of gold and other mines, it was subsequently suspected that the gases in the mine atmosphere might prove to be an important factor in accelerating silicosis, and experiments were carried out in which such gases as sulphur dioxide and nitrous oxide were used in minute proportions. Later, when Dr. W. R. Jones suggested that sericite and not quartz was responsible for miners' fibrosis, it was decided that the workers at the Banting Institute should perform their experiments in three groups. The effects were observed on animals in: (1) An atmosphere containing mine gases alone; (2) an atmosphere containing mine gases and quartz dust; (3) an atmosphere containing mine gases and sericite dust. From these experiments it seemed doubtful whether real silicosis was initiated, since no definite lesions were noted in the lungs.

* *Industrial Medicine*, July, 1935, p. 388.

"The following conclusions had been drawn during the investigations: (1) That all people aggregated a cumulative amount of silica in certain organs, from birth to old age, and that if a man lived to, say, 200, he would probably resemble a silicotic case; (2) that silica was fairly soluble in the body and that the organs of excretion threw off a certain amount; (3) that the gases used in their animal experiments damaged the organs of excretion, and thus a higher amount of silica was retained by the animal; (4) that the mineral particles in the lung revealed by the microscope played little or no part in the acceleration of silicosis, but that the fibrosis was caused by some form of 'easily soluble silica', probably introduced in extremely minute form."

Nature of silica dust: Research in the field of dust inhalation appears to have demonstrated that, in general, the degree of health hazard associated with the inhalation of any dust, all other factors remaining constant, depends upon the mineral composition of the dust. Knopf[22] states that the harmfulness of a quartz-containing dust usually is in direct proportion to its quartz content; therefore, in an attempt to evaluate the harmfulness of a dust it is of great importance to ascertain its exact mineral composition.

A long-established convention has led to the reporting of chemical analyses of rocks and minerals in terms of certain chemical compounds (usually oxides) rather than in terms of chemical elements.[22] During analysis the silicon is isolated in the form of silica; consequently the chemical analysis of an average granite, for example, is reported as containing 70% of silica. About 30% (roughly one third) of the entire granite is quartz, whereas the other two thirds of the granite comprises chiefly complex mineral salts of silicon-bearing acids; such minerals are known as silicates. The remainder of the silica reported in the chemical analysis of granite (40%) is locked up in these silicate minerals, chiefly feldspar and mica.

This arbitrary convention of reporting rock and mineral analyses in terms of oxides has necessitated the use of the expressions "free silica" and "combined silica" to distinguish the silica that makes up quartz (or the few other minerals that are composed of silica alone) from the silica combined with other elements in the various silicate minerals.[22] In the granite cited the 70% total silica is the sum of 30% free silica and 40% combined silica.

According to the Industrial Health Section of the Metropolitan Life Insurance Co.,[23] although obviously dust containing 90% silica is more harmful than dust containing 60%, it is not known whether the relative harmfulness is one of strict arithmetical proportion.

The argument whether the cause of the lung condition called silicosis is due to free silica or to sericite has not been settled. With white mica dust Policard[24] produced experimentally pathological lung changes identical with those produced under the same experimental conditions by inhalation of various siliceous rock dusts, such as standstone. He assumes that in the latter case the noxious constituents are minerals of the mica family, such as sericite, and not the classically accepted free silica. According to this author:

"The results obtained favor Jones' sericite theory as to the causation of pulmonary silicosis and show how fragile and uncertain is the pathogenic basis for the current conception of pulmonary silicosis."

Collis[25] made the following comment in his abstract of Policard's paper:

"The observations ceased 30 days after dusting, which Kettle has shown to be far too early to determine the 'activity' of a dust. Further, the special characteristic of silicosis is its tendency to encourage the growth of tubercle bacilli; it is this which constitutes its noxious nature, not some microscopic reaction. No attention is paid to this matter."

On the other hand, LeClerq[26] reports that of 350 selected underground coal-mine workers carefully examined by physical, x-ray, and clinical laboratory methods, 271 were negative, 20 showed discrete benign fibrosis not associated with occupation, 15 had lesions of noninfective pulmonary fibrosis undoubtedly due to anthracosilicosis but with no associated incapacitation, 18 had clinical and radiographical signs of silicosis with slight incapacitation, and 26 had traces of infective pulmonary sclerosis. In this group 13 were definitely silicotic; eight had definite signs or were strongly suspected of having tuberculosis, and five had silicosis with tuberculosis. These cases developed among miners working in a coal-bearing stratum paralleled by strata of sandstone and schist, both of which contain free silica. The fibrous silicate, sericite, does not occur in this region. Of 177 samples of mine dust examined 93 showed crystalline silica in varying amounts (10 to 60%).

In his report of a study of silicosis in the granite and foundry industries of Massachusetts Pope[27] states that petrographic analysis showed sericite in significant amounts in the granite from only one city studied — Fitchburg—where the incidence of silicosis was low. In the granite from Milford, where the incidence of silicosis was more than three times as great, barely a trace of sericite was found.

Particle size of dangerous dust: The significant part played by the size of dust particles is indicated by the fact that although in South Africa visible dust has been very largely removed from the air breathed by the miners silicosis is still produced. Pirow[28] is not convinced that the Rand standard of 300 particles per cubic centimeter is safe. Mavrogordato[29] emphasizes that all visible dust can be easily removed, leaving the dangerous dust; therefore size frequency is of great importance. Naturally the more concentrated the quantity of dust and fume in suspension in the atmosphere the greater the danger to which the workman is exposed, and unquestionably the smaller the particles the greater the likelihood of their entrance into the interstices. The size of particles in prolonged suspension in the air is more likely to be under five microns than over; probably the most dangerous dust is that ranging from two microns to .5 micron or smaller because these impalpable particles readily remain in suspension in the air for long periods of time. The size of fume particles ranges from one to 0.2 micron in diameter. In other words, it is thought that the smaller the particles the greater the danger, although there may be a lower limiting size as well as a higher one; unless especially warned, employers and workmen are prone to regard impalpable non-visible dust as altogether harmless. Dust particles under five microns in size readily pass through the mouth and nose, traverse the bronchial passages, and lodge in the alveolar tissue, from which remote parts of the lung structure they usually cannot be dislodged by hawking or coughing. The size of the dangerous dust (supposedly one to five microns) is roughly that of the tubercle bacillus. Such particles are like smoke or vapor; they cannot be washed down by spray since they recoil from drops of moisture, nor can they be conceived as exerting an abrasive action when moving gently within the lungs. Since similarly fine particles of other dusts when inhaled are not followed by the pathological changes characteristic of silicosis the conclusion (and this is now held by many, probably most, authorities on the subject) is that silica dust exerts a chemical rather than a physical action upon living tissues. Badham, Rayner, and Broose[30] suggested that if every individual particle is equally dangerous in initiating fibrosis then the one-micron particle is the worst because it is in the majority; if fibrosis results from chemical action depending on solubility of dust particles then the two-micron particles are the worst because this size exposes the largest surface; but if the quantity of dust is the most important factor then the three-micron particle is the worst since this size contributes the most weight. If number, surface, and weight are factors then sizes of one to three microns are the most pernicious (these authorities apparently are at least somewhat doubtful as to the underlying cause of dust harmfulness). Greenburg[31] considers a knowledge of the weight of dust of much value, but because it is virtually impossible to separate the particles less than 10 microns in size from those over 10 microns to obtain the weight of the injurious particles (those capable of gaining access to the lung tissue) and also because one large particle may weigh many hundreds of times more than a smaller one, the weight of a given sample of dust must be used only as an additional guide in the interpretation of results, and then with some degree of caution.

Quantity of dust required to produce silicosis: According to Loriga, the quantity of dust that will provoke silicosis cannot be given precisely, since it is not the absolute quantity or quality that matters but the relative quantity. One person might resist a proportion of 100 particles per cubic centimeter, while another would react unfavorably to 50 particles; there is also the whole question of the rate of inhalation.

According to Ballantyne, in Great Britain the criterion of safety sug-

gested, rather than expressed, in the Workmen's Compensation Schemes goes no farther than the composition of the mineral substance itself. The composition of the dusty atmosphere —that is, the concentration of the SiO_2 therein—is not mentioned; the Refractories Industries Scheme does not apply if the mineral contains less than 80% total silica. In the sandstone industry the Scheme ceases to apply if the sandstone is shown to contain less than 50%. In the United States it is customary to gage the risk by the number of particles of free silica per cubic foot of air, irrespective of the other constituents of the dust. In South Africa the total number of mineral particles per cubic foot is taken as the basis. Certain standards, chosen more or less empirically from a study of particular industries, have been adopted on these lines. Ballantyne thinks that international agreement on methods of estimating the number of dust particles in the air and of interpreting the "counts" obtained is much to be desired.

Badham[32] states that if the average exposure on the Rand is about 1 mg. per cubic meter the prospects of attacking the disease by reducing the amount of dust inhaled seem rather hopeless.

In South Africa, where the dust is said to contain more than 85% free silica as quartz, a tentative standard of 300 particles per cubic centimeter of air (8.5 million particles per cubic foot) has been set[33] as the upper limit of dustiness to be regarded as allowable.

Investigation in certain plants of the granite-cutting industry in the United States[33] revealed a content of 31 to 38% free silica in the form of quartz. In a study by the Public Health Service[33] the workers were divided into four groups, depending upon the average exposure in terms of amount of dust in the air, with the following results:

"In group A, which included hand-pneumatic tool operators and in which the exposure averaged about 59 million particles per cubic foot of air, it was found that practically 100% developed an established silicosis within 10 years from the time of beginning employment. Also, in this group the highest rate was found for cases diagnosed on physical examination as having active tuberculosis. . . .

"In group B were included those workers other than hand-pneumatic tool operators who were also exposed to more than the average plant dustiness. Taking the group as a whole, the average dust concentration was nearly 45 million particles per cubic foot of air. This group showed the same reflection of a dust hazard as group A.

"In group C, consisting of those occupational groups exposed to the average plant dustiness (about 20 million particles per cubic foot of air), silicosis developed much more slowly than in the groups just discussed and there appeared to be very little excess in the rate for tuberculosis, with no tendency for an increase according to length of service. Analysis of occupational mortality over a period of 25 years, however, indicated that some of the occupations in this group may possibly have been exposed to a real dust hazard.

"Group D was made up of those occupations in which the dustiness was less than that of the average plant atmosphere. The average exposure for the group was less than 10 million particles per cubic feet of air. Although a certain amount of silicosis was found even in this group, there was no indication of serious results, even when the workers had been employed for many years.

"From the results of this study it was found practicable to suggest a tentative standard for the upper limit of allowable dustiness between 10 and 20 million particles per cubic foot of air for workers exposed to dust resulting from granite cutting. The same limit would presumably be applicable in the case of other dusts with the same physical characteristics, particularly with a quartz content of about 35%."

THE Industrial Commission of Wisconsin reports[34] regarding the amount of dust to be allowed in the air breathed by workers:

"The maximum silica-dust concentration considered permissible in the air breathed by a workman at any point in the normal breathing zone has not been definitely established. The commission, its advisory committee, employers and scientists have agreed on a tentative figure of 15 million countable dust particles under 10 microns in longest dimension with free-silica content of 35% in a cubic foot of air as determined by United States Public Health Service technic. Variations in free-silica content will make proportional inverse changes in this standard. In the case of practically pure silica the permissible dust count would be 5,250,000 countable particles. By countable particles is meant those particles within the range of size from two to 10 microns in the longest dimension. Dust particles larger than 10 microns in the longest dimension do not ordinarily reach parts of the body which they can injure."

From a study made in a bituminous-coal mine the United States Public Health Service[35] found that the incidence rate of respiratory attacks in those exposed to heavy concentrations of dust (105 million particles per cubic foot of air) was 79% above that in the group exposed to relatively little dust (three million particles per cubic foot of air) and 83% higher if based on the men employed throughout the period of the study. The excess lies in minor, upper respiratory disease.

Tillson[36] calls attention to the factors affecting the transportation of dusts by the wind as vital to the problem; they are size, shape, and specific gravity of the dust particles and the velocity, density, viscosity, adsorption, wetting power, humidity, temperature, and pressure of the transporting fluid. Various ratios, such as the maximum projected area of surface per units of volume and mass and the total surface area per units of volume and mass, are important derivatives of the particle factors. A thin flake or a needle form (acicular shape) will have a slower settling rate from a horizontal stream than a spherical form of the same volume and mass.

According to Tillson[36], the silica dust found in the lungs has a maximum dimension ranging from less than .5 micron to a maximum of about 10 microns (or about .0004 inch). Some experts hold that dust less than .5 micron in size remains suspended in the expired air and so does not lodge in the lungs, but Tillson doubts whether the evidence is strong enough to warrant such a conclusion. He thinks that too little attention has been given to the form factor of the dust particles in the study and tabulations of dust counts; some observers believe that dusts in the size range .5 to 3.5 microns are the most dangerous because of two factors — percentage of surface exposed and percent of volume, respectively, in each intermediate size compared with the total surface of total

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volume of all sizes from .5 to 10 microns when their frequency ratio in the whole amount of such dust is considered. Many persons believe that dust over five microns in size is not particularly dangerous.

Tillson says[36] that it is an oversight to consider the dust particles recovered from the lungs by postmortem as evidenced of the size and nature of the particles that are most dangerous, because silica dissolved in the slightly alkaline fluids of the body is thought to be responsible for abnormal conditions of the cell structure of the lungs; therefore, the dust that has produced the disease probably has been partly or wholly dissolved and cannot be recovered. Moir[37], of South Africa, found 13% of 126 dust particles from two specimens of a silicotic lung were less than .5 micron, 36% less than one micron, and 60% one to three microns, so that the median size was 1.2 microns. Bloomfield[38] studied 11 different kinds of aerial industrial dusts and found only 2% less than .5 micron, 21% less than one micron, 71% one to three microns, and the remainder less than five microns. Badham[39], of New South Wales, found that 67% of the dust particles smaller than eight microns examined by him were below 1.5 microns in maximum dimension and that only one in every 3,000 was eight to 10 microns or greater. The authorities at Broken Hill, New South Wales, found that for every particle, in a count of 3,500 particles in lung sections, having a diameter greater than 7.5 microns at least 100,000 particles of a smaller diameter were present; but McCrae[40], of South Africa, found that 70% of the quartz particles in the ash of silicotic lungs was less than one micron in size. Premised on the number of particles of silica dust per cubic centimeter of air (specific gravity of silica, 2.64), Badham[39] has computed that the respective amounts, depending on shape of particle, will add 1 mg. of weight to one cubic meter of air: Tetrahedral particles (triangular pyramids), 400 per milligram; spherical particles, 90 per milligram; and cubical particles, 50 per milligram. At an average figure of size-frequency ratio of three to one he assumes 100 particles per milligram, of which 87% by weight are smaller than 5.5 microns. He states that the size-frequency ratio will vary with the time allowed for settling before the sample is taken. In South Africa investigators found that 20 minutes were required for five micron particles to settle six feet in quiet air and that eight hours were required for a one-micron particle to settle the same distance. Jones[41] noted that the granular silica particles settled more rapidly than the smaller acicular sericite particles, so that the percentage of silica dust in the air after blasting was almost invariably lower than in rock borings, noticeably so when samples were taken three hours after blasting. He also calls attention to the fact that a 10- by 8- by 5-micron quartz particle taken from a lung has a volume equal to 800 sericite fibers two microns by .5 micron wide and deep and that the quartz grain has 1,630 times as much silica as the sericite fibers. He does not suggest that no quartz enters the alveoli of the lungs but that he has found scores of sericite fibers for every grain of quartz.

JONES[41] also states that he extracted 10 grams of dust from the lungs of a man who died from silicosis after 14 years' exposure. Therefore, if the unknown amount of dust which the lungs ejected or dissolved is ignored, the accumulation amounted to .0024 gram (240 million particles) per day. He assumes that less than 1/400 gram (250 million particles) per day produces fatal silicosis and states that he has known of other lungs in which the dust proved fatal with only 1/1200 gram (83,300,000 particles) per day. In the former case Tillson[36] assumes from Badham's figures that there were only one million million particles in the lungs. The United States Public Health Service has recommended a dust content below 10,000,000 particles per cubic foot of air in granitework where the quartz content of the rock in 35% and affirms that 6,000,000 particles per cubic foot of air is the acceptable limit where sand-blasting is done with quartz sand (90% or greater content). If the amount of lung ventilation during violent exercise is accepted as 42 to 43 liters per minute according to Tillson[36] about 1.5 cubic feet of air per minute are apparently inspired, therefore the concentration of dust noted above would supply more silica dust in three to three and a quarter years than has been found as the lethal content left in the lungs. Some writers claim, however, that only 50% of the inhaled dust remains trapped in the lungs and nasal or respiratory passages, the remainder being exhaled. If the air in the streets of lower Manhattan, New York City, the dust count of which is 3.2 million per cubic foot of air, were entirely siliceous, according to Tillson's calculation about four years' exposure might supply the 10 grams cited by Jones, and on the basis of 50% elimination eight years would provide a lethal dose. As cited by Bloomfield[38], dust counts for different occupations of the granite-quarrying and granite-finishing industry ranged from 17 to 144 million particles per cubic foot with a quartz content of 35%; in quartz-grinding plants the counts ranged from 55 to 173 million particles per cubic foot with a 99% quartz content. Death, then, would be expected after exposure for 54 days. Evidently the human system has more effective ways of disposing of such dust, considerable time is necessary to pro-

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duce the fatal toxic and pathological changes, or possibly (as Jones suggests) the free silica is not the important dust hazard, but some other mineral present in minute percentages is chiefly injurious.

Watkins-Pitchford[42] has stated that experimental observations on animals show that if exposure to silica dust is intense enough no individual will escape development of nodular pulmonary fibrosis. If the quantity of dust inhaled by miners has been relatively small it may be surmised that the processes whereby the particles are removed from the lungs generally are active enough to prevent that degree of accumulation of particles prerequisite to the development of the ordinary form of silicosis. However, he calls attention to the fact that despite the non-development of silicosis in some of those exposed to dust for a long period it appears that many of them nevertheless are faced with the liabality to such development. As an example, he states that several of the long-service miners who took part in the World War and who were non-silicotic when they left their work had devolped the disease when they returned. He considers that this state of liability depends upon the continued retention in the lung tissues of the requisite number of silica particles; it ceases when a certain proportion of them have escaped in the expectoration, have been removed by other channels, or have dissolved finally. The agency which converts the liability into a manifestation of the disease in any particular case is usually a tuberculous infection. The state of the individual thus liable to develop the disease without inhaling any more silica dust is conveniently referred to as latent silicosis.

Length of dust exposure required to produce silicosis: A significant point mentioned in a medical report by Sutherland and Bryson[43] on the incident of silicosis in the pottery industry, published in 1926, was the frequency with which fibrosis of the lungs was diagnosed by medical examination at a period of employment earlier than that at which silicosis had been found by radiological examination in the same occupational groups. The report states that possibly fibrosis of the lungs, as found clinically, develops in a shorter time or requires a lower concentration of dust than silicosis discernible radiologically; therefore, in occupations where both conditions are found fibrosis of the lungs commonly precedes silicosis. The cases of silicosis in the pottery industry, grouped in the report according to years of employment, were:

Years	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	Over 40
Cases	1	2	8	7	14	15	15	8	17

According to this table, most of the cases in the pottery industry develop after 20 years of employment in the industry. The authors consider it significant that in the occupations where the incidence of silicosis is high the disease becomes evident at an early stage in the occupational history.[43]

The period of exposure required to produce silicosis depends primarily on the individual, according to Moore[44]. In the Bendigo mines the silica content of the dust is over 90%; on the west coast of Tasmania about 60% and in Kalgoorlie, a little above 60%. Moore[44] states that the Bendigo statistics are not very trustworthy, as the miners are loth to be examined, but the average period required to produce silicosis seems to be about 10 years; in Kalgoorlie it is nearer 16 years. He concludes that silicosis seems to depend pretty accurately on the silica average in the country rock.

Böhme[45] cites German experience to show that sand-blasters and sand-grinders have well-developed silicosis sometimes after three years' exposure; generally it develops after about 10 years. Koelsch[46] observed that two cases of severe silicosis developed after two and a half years of employment on sand-blasting; the workers were 25 and 30 years old, respectively.

According to Cunningham[47], the exposure necessary to produce ante-primary silicosis in Ontario gold mines is nine to 10 years. The per centage of free silica is about 30 to 35. In England the apparent exposure to silica dust necessary to produce silicosis has been short; Middleton[48] mentions a case of fatal tuberculosis with evidence that it had been produced by silicosis after two and a half years of exposure.

More investigative work on silicosis has been done in South Africa than in any other country; the following summary of experience in that country on this phase of the subject is therefore interesting[49]:

"In previous reports one has had occasion to emphasize the fact that the data regarding the mean duration of service of new silicotics obviously apply only to those miners who do actually contract the disease. They cannot be taken as a measure of the 'average effective life of a miner' in the sense that all working miners will on the average become silicotic after some 14 years of underground work, since they leave out of account the service of the remaining miners who have not contracted the disease, and some of whom may never do so.

"On the rates of incidence of the compensable diseases which obtained in 1918 to 1920, 50% of the original body would have become affected by one or the other of these diseases by the 13th year of work; on the rates of 1920 to 1923 the corresponding figure would have been the 17th year; on those of 1928 to 1929 the 20th year; while, from the trend of the figures calculated on the incidence rates obtaining in 1931 to 1932, it can be concluded that a corresponding position would not be reached now until between the 25th and 26th years of underground work. This method of analysis affords a concrete illustration of the progressive potential advantage conferred by the progressive fall in the rates of liability to contract silicosis to which reference has repeatedly been made."

The effect of long exposure to granite dust is shown in the history of eight cases cited by McFarland[50]. In three cases of simple silicosis the ages were 34, 39, and 42, while the duration of exposure was 14 years in the first case and 23 in the other two. In five cases of silicosis with tuberculosis the ages were 50, 56, 57, 59, and 63, and the years of exposure 35, 42, 34, 38, and 50, respectively.

In a study of sandstone-quarry workers Hayhurst and his co-workers[51] found that the stage of silicosis varied in proportion to the years of exposure except that silicosis plus tuberculosis manifested itself as early as beginning silicosis, that is, after about 15 years' exposure; they found that few men suffered from silicosis under 25 years of age but that at 34 there were as many silicotics as non-silicotics and again after 44 years of age there were sometimes more silicotics than non-silicotics.

IN AN investigation of the granite industry the United States Public Health Service found that in the group of workers exposed to the heaviest dust the first case of silicosis appeared after approximately two years and by four years all in this group seemed to have developed at least an early case of silicosis. In the same group the first case of more developed silicosis appeared after five years of service, and by nine years approximately 90% had advanced to this stage. In the group with an average exposure of less than 10 million particles per cubic foot of air two cases of early silicosis had developed after 10 years' exposure and one case of moderate silicosis after six years.

In a similar study of the cement industry the Public Health Service found that the earliest case of pneumoconiosis appeared after three years' exposure to cement. Of 53 men selected for examination 37 had worked in the industry more than three years. Of the 37, 15 showed evidence of pneumoconiosis, and three of these also had tuberculosis; of 22 who showed no indication of pneumoconiosis eight gave evidence of arrested tuberculosis, four showed no evidence of either pneumoconiosis or tuberculosis, with 10 doubtful.

Chapman[52] reported three cases of acute silicosis, among the first cases in American industry, in which the appearance of respiratory symptoms after eight, 21, and 29 months of exposure to an alkaline dust of high silica content marked a more rapid and severe silicosis than usual. He states that the rapidity of the process, in contrast to the usual chronic form, probably was due to the accelerated formation of silica hydrosol in the presence of an alkaline soap dust. McDonald[53] described the rapidly fatal cases of two young girls who had been employed 2.75 and 4.25 years packing a silica soap powder. According to Chapman, Russell[54] saw the disease fully developed in a lens grinder who inhaled a pure quartz spray for eight months.

In describing four cases of silic-

osis or silicosis and tuberculosis which developed many years after relatively short exposures Britton and Head[55] stated that cases of this kind suggest the necessity of revising the conception of the length of exposure necessary to produce the disease and emphasize that once a man has developed symptoms while still engaged in the dusty occupation stopping the work does not prevent the gradual, steady progression of the pathologic changes. The cases described developed symtoms of silicosis 23 years after an exposure of four months, 10 years after an exposure of two years, 14 years after an exposure of four years, and 10 years after an exposure of 10 years. The following table taken from the **Colliery Guardian**[56] gives the number of deaths from silicosis and silicosis with tuberculosis, by industry, average age at death, and duration of employment reported for 1932 to the British Factory Inspection Service:

Industry	Number of Deaths	Average Age at Death	Duration of Employment, Years: Longest	Shortest	Average
Pottery:					
Silicosis	72	55.6	57.0	10.0	39.8
Silicosis with tuberculosis	75	55.2	67.0	13.0	37.9
Sandstone:					
Silicosis	21	57.3	57.0	20.0	40.4
Silicosis with tuberculosis	39	52.3	53.0	16.0	34.8
Grinding of Metals:					
Silicosis	4	47.3	45.0	18.0	30.8
Silicosis with tuberculosis	26	51.1	48.0	2.8	30.2
Sand-blasting:					
Silicosis	7	40.7	16.0	4.5	10.3
Silicosis with tuberculosis	16	44.2	20.0	2.5	8.3
Scouring-powder Manufacture:					
Silicosis	3	37.0	11.0	5.25	7.8
Silicosis with tuberculosis	2	33.5	10.75	2.0	6.4
Miscellaneous:					
Silicosis	7	55.3	45.0	2.8	20.4
Silicosis with tuberculosis	9	50.9	34.0	11.0	24.0

The diagnosis of all these cases was verified by postmortem.

Kilgore[57] shows the course of six cases of pneumoconiosis developed after comparitively short exposures to pulverized quartz used in a polishing powder:

Case	Age, Years	Dust Exposure, Months	Onset After Exposure, Months	Life After Exposure, Months
1	70	16*	(?)	84
2	50	27	(?)	23
3	36	14	14	Still Living
4	39	14	24	50
5	31	10	9	14
6	31	12	11	21

* Not Grinding Quartz

IN A study of the effects of exposure to dust in coal mining the Public Health Service found an apparent relation between the occurrence of generalized fibrosis and length of time the workers had been employed in the industry. The percentage rises from 4.8 in the group with less than five years' service to 69 in the group with more than 15 years' service; even if attention is confined to workers under 45 years of age, the percentage in the group with more than 15 years' is 66.7.

Pancoast and Pendergrass found that the longest period of occupation in a sand-pulverizing plant was two and a half years at intervals, and the shortest was said to have been only 35 days during a period of a little over one year before symptoms of lung affection appeared.

Quaintance and Morris[58] examined 58 pottery workers in an industrial plant manufacturing bathroom ware, using a silica content of approximately 25%. After an average exposure of 16 years 8.6% of these workers had advanced fibrosis; 38% had second-stage or moderate fibrosis; 63.5% had only slight fibrosis.

Data collected by the United States Bureau of Mines at Picher, Okla., show that first-stage silicotics had worked underground two to 30 years, an average of 12.99 years for all men, irrespective of occupation; for facemen, 12.34 years; and for men exposed to large amounts of dust, such as drillers, shovelers, and their helpers, 9.6 years. Second-stage silicotics had worked underground two to 36 years, an average of 15.8 years for all men, irrespective of occupation; for facemen only, 13.3 years, and for drillers, shovelers and their helpers, 12.8 years. Third-stage silicotics had worked underground three to 40 years, an average of 18 years for all occupations; for facemen only, 16.1 years; and for shovelers, drillers, and their helpers, 15.5 years. The average number of years worked before the various stages of silicosis developed is shown in the following table:

	Years
First-stage silicosis	11.9
Second-stage silicosis	14.3
Third-stage silicosis	17.1
First-stage silicosis plus tuberculosis	19.4
Second-stage silicosis plus tubeculosis	18.0
Third-stage silicosis plus tuberculosis (only two cases)	11.5
Early tuberculosis	8.7
Moderately advanced tuberculosis	21.2
Advanced tuberculosis (only one case)	30.0

EXAMINATION of ex-coal miners failed to show any benefit from previous exposure to coal dust. Of the 599 ex-coal miners who had worked in coal mines for periods ranging from a few weeks to 52 years (average, 12 years) 167 had silicosis in one of the three stages. The periods that these coal miners worked in zinc and lead mines averaged 7.7 years for first-stage silicotics, 9.0 years for second-stage silicotics, and 14.9 years for third-stage.

Lochtkemper and Teleky found that silicosis developed after two years' work in a polishing-powder factory and in sand-blasting with the free blast, both occupations showing the highest number of dust particles; in automatic sand-blasting rooms with only 160 dust particles per cubic centimeter silocisis did not develop until after four or five years' exposure. An early case of silicosis developed in the crushing mills after three months' work, stage II after 1.75 years, and stage III after 2.75 years. Stage III silicosis developed after six and 15 years' exposure in cement works, where the greatest number of particles were quartz sand; when the quartz dust was mixed with clay dust stage III silicosis was reached sooner.

Dreessen[59], in his study of the effects of silicate dusts, found pulmonary fibrosis or pneumoconiosis in all six workers who had been exposed for six years or more to 1,440 million particles per cubic foot of tremolite talc. Of 33 workers exposed to 52 million particles per cubic foot 10 showed signs of pneumoconiosis, one after five years, one after six years, two after nine years, one each after 11 and 12 years, one after 15 years, and 2 after 30 years or more of exposure; one man who had worked in talc for over 40 years had second-stage pneumoconiosis. In the group exposed to four million particles per cubic foot no definite cases of pneumoconiosis were seen.

From the study of granite cutters in New York City, Smith[60] reports the following regarding length of exposure to dust and development of silicosis:

"The average age in the negative group was 30 years. In the 'increased-fibrosis', 'questionable-silicosis', and 'first-stage-silicosis' groups it ranged in the vicinity of 41 years; in the group showing second-stage silicosis it was 57, and in the group with evidence of tuberculosis and silicosis it was 50 years.

"Three of the men examined had been exposed under five years; these cases fell in the 'negative' and 'increased-fibrosis' groups. Three had been exposed over 50 years; these cases fell in the 'second-stage' and 'tuberculosis-with-silicosis' groups. Among the cases showing first-stage silicosis, more fell in the 20 to 29-year exposure group than any other, though two had been exposed less than 10 years. Among the cases with second-stage silicosis more fell

in the 30 to 39 year exposure group than in any other. Among those with silicosis and tuberculosis the majority had been exposed from 20 to 29 years. The cases showing 'questionable silicosis' were equally distributed over all exposure groups.

"The picture given is one of a slowly developing type of silicosis which may show its first stages after anywhere between five and 40 years and tends to become advanced with a marked tendency to be complicated with tuberculosis after 20 years' exposure."

The following statement from the **Colliery Guardian,** August 10, 1934[61], gives additional data on the length of exposure required to produce silicosis and average age at death:

"Full particulars are available of 469 deaths from silicosis or silicosis with tuberculosis, in which there is no doubt as to the precise cause of death. In the 204 deaths from silicosis the average age at death was 54.3, and the average employment 34.3 years (2.3-60 years), whilst in the 265 deaths from silicosis with tuberculosis, the average age at death was 52.3 and the average employment 31.5 years (2-67 years)."

The relation of the amount of dust breathed and length of exposure to the development of silicosis is shown by the investigations of Bloomfield and Dreessen[62] (207) in a granite quarry and by Pope[27] in the granite and foundry industries. Bloomfield and Dreessen[62] found that in the quarry industry pathological changes due to dust are limited to drillers—the only persons creating dust. The Leyner drillers and plug and jackhammer drillers working in the quarry holes were exposed to 144.4 and 112.1 million particles per cubic foot. Ten drillers showed signs of silicosis, half of those exposed five to 19 years had silicosis, and four of the five men exposed for more than 20 years were affected.

The following table, prepared from Pope's report[27], shows the relation of amount of dust breathed and length of exposure to production of silicosis in the granite and foundry industries:

Dust Count	Weighted Average of Median Dust Counts, Million Particles Per Cubic Foot		Percentage Having Silicosis: Under 10 Years		10 to 24 Years		25 Years or More	
	Foundry	Granite	Foundry	Granite	Foundry	Granite	Foundry	Granite
Group A ..	32	40.4	5.1	4.8	20.6	31.9	43.7	62.8
Group B ..	14	17.1	4.6	4.6	12.1	10.8	34.3	20.8
Group C ..	5	8.9	.7	6.0	5.6	11.1	25.9	6.3

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News and Opinion

It's a Long Worm—

EAGLE-PICHER Lead Company, of Joplin, Mo., according to an Associated Press item of March 14, has filed suit for $100,000 damages against an attorney, two doctors, an auditor and three other men, of the neighborhood, charging that the defendants have conspired to cause former employees of the company to sue the company for damages for alleged lead poisoning.

Fair and Workable

OUR[1] [Occupational Disease Compensation] Act has been drawn after extensive conferences with all

1. HON. HARRY MCMULLAN, Chairman, North Carolina Industrial Commission, *Popular Government,* May-June, 1935.

ATTORNEYS' TEXT BOOK OF MEDICINE

by

Roscoe N. Gray, M.D.

Surgical Director

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Doctor Gray's work brings him into daily contact with hundreds of physicians and surgeons. He is the focal point for a nation-wide medical experience—abreast of new developments in many specialties. The enormous amount of scientific data gathered from research in this wide experience is the basis for his useful new book, the *Attorneys' Textbook of Medicine.* It deals with the field of medicine in which compensation and liability claims most frequently arise; is of utmost practical value to Doctors and Lawyers; is so written that Lawyers may understand Doctors, while, at the same time it is of utmost *practical service* to Doctors in diagnosis and treatment. The text is supported throughout by recognized authorities whose works are cited. It presents medicine through the eyes of the Insurance Carrier, a most important viewpoint, both for the protection of the patient and the protection of society. It aids the Doctor to qualify in the service of insurance carriers on compensation and liability claims.

The usual medical text is of little value in meeting the modern medicolegal problems discussed by Doctor Gray, Silicosis, Buerger's Disease, Chromium Poisoning, the comparative values of permanent disabilities, etc., etc. A condensed table of contents follows:

Accidents

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Anthracosis
Asbestosis
Baker's Itch
Benzol Poisoning
Carbon Monoxide Poisoning
Carbon Tetrachloride Poisoning
Chromium Poisoning
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Sulphur Dioxide Poisoning

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Trichomonas
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Compressed Air Disease
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Industrial Medicine

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interested groups. Since its enactment we have received from authorities in other states many letter indicating that in their opinion North Carolina's Act is perhaps the best approach to the problem which has been, as yet, made by any state. We regard the statute as fair to the employer and to the employee and definite and workable in its essential provisions."

Grand Gesture

BY EXTENDING the workmen's compensation law to "any and all occupational diseases" incurred by a worker, the state has made a grand gesture, which, unless modified, will unquestionably result in the raising of the compensation insurance rate on foundries in New York to a degree that will drive every foundry out of the state.[1]

Hernias and Holidays

RHEUMATISM, and we say it in all seriousness, has been driven completely cut of the state. Since the inception of the [Compensation] Act almost 19 years ago, no working man has apparently ever suffered from this ailment—an excellent situation in and of itself; but, unfortunately, sprains and strains have taken its place.

"Hernia seldom if ever occurs outside of working hours; never on a Sunday or a holiday. A former member of this State's Compensation Board has said that 95% of the claims for hernia, which have been compensated, should never have been paid—a wholesale fraud if ever there was one."[2]

Occupational Deafness

OCCUPATIONAL deafness[3] is becoming more and more common, and as our cities become noisier there is an increase in occupational deafness among printers, bus drivers, road makers and traffic policemen. Not only does the continual pressure of strident sounds to which these workers are subject tend to produce impairment in hearing, but there is also a strain on the nervous system which leads to neurasthenia and other ills.

New York Industrial Council

THE INDUSTRIAL COUNCIL, under the compensation amendment, effective July 1, 1935,[4] is "composed of 15 members appointed by the governor," with five members "known to represent the interests of employees," five "known to represent the interests of employers," and five physicians "licensed to practice" in New York State.

The council is "to advise the commissioner." The personnel is:

Representing EMPLOYERS:

1. Maxwell S. Wheeler, Buffalo;
2. Frederick H. Swan, Rochester;
3. Charles M. Winchester, Albany;

1. Personal Communication.
2. C. B. Auel, Westinghouse Electric and Manufacturing Company, Harrisburg, Pennsylvania, May 21, 1935.
3. From an article entitled "Noise," by Edward Podolsky, M.D., in *Illinois Medical Journal,* May, 1935, p. 478.
4. New York Workmen's Compensation law amendment, Chapter 258 of the laws of 1935; for full text see *Industrial Medicine,* May, 1935, p. 272.

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"Industrial Hygiene Instruction",

"A Program for a National Institute of Occupational Diseases".

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Benzol Poisoning, Lead Poisoning, Pulmonary Asbestosis and Dust Determinations will also be discussed.

The Speakers

The following well-known names appear on the program:

Dr. J. A. Britton, Supervisor of Medical Service, International Harvester Company,

Mr. J. J. Bloomfield, of the United States Public Health Service,

Dr. C. O. Sappington, Consulting Industrial Hygienist,

Dr. Edward S. McSweeny, Medical Director of the New York Telephone Company,

Dr. Emory W. Sink, Assistant Professor of Hygiene and Public Health at the University of Michigan, and

Dr. Henry H. Kessler, Medical Director of the New Jersey Rehabilitation Commission.

The Audience

Industrial physicians, directors of industrial relations, industrial nurses, industrial hygienists and others concerned with medicine and hygiene in industry.

An Invitation

The readers of this magazine are cordially invited to attend the Milwaukee sessions, the week of October 7, and participate in the discussions.

The Chairman and Secretary of the Industrial Hygiene Section will welcome your inquiries.

HENRY H. KESSLER, M.D., Chairman
Medical Director, N. J. Rehabilitation Commission.

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5. Sylvan Stix, New York.

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Medical Referees in Massachusetts

INDUSTRIAL disease cases are to be referred to industrial disease referees—three impartial physicians chosen by the board from a list submitted by the board of registration in medicine; and "the diagnosis of a majority of the referees shall be binding on the parties." This by the new amendment of the workmen's compensation law (House 2147), enacted and signed.

Books

The Pneumonokonioses (Silicosis). Bibliography and Laws. By G. G. Davis, E. M. Salmonsen, and J. L. Earlywine. Cloth. Pp. 482. Chicago: **Industrial Medicine, Inc.**, 1934.

PHILIP DRINKER'S Review*: "The Pneumonokonioses (Silicosis), Bibliography and Laws" is a reference book, designed for the permanent convenience of physicians, surgeons, lawyers, industrial executives, librarians, journalists, engineers, trade-association officials, students, and research workers.

The references are gathered from the literature of the world; they begin with Agricola's "De re metallica" in 1556, and end with the last published reference in December, 1933. The compilers, believe that "no references of importance, and very few of any kind, have been omitted."

The arrangement of Section 1 containing 2768 references is simple and logical. The subject index is fairly inclusive as is the author index.

In Section II are the laws of the various states and decisions, with citations, on the general subject.

The 1932 bibliography on Pneumoconiosis published by the International Labour Office suggests the use of the shortened term "in spite of the recognized fact that according to derivation, the form 'pneumonoconiosis' would be correct." (Incidentally this Journal and many others have adopted the shorter word.) This bibliography contains 633 references and seems to have been ignored by the present compilers.

The reviewer confesses admiration at the small number of errors and repetitions in the present bibliography. Anyone specializing in any aspect of the silicosis problem will find the compilation extremely useful but would welcome still more the promised future editions containing annotations on leading articles.

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